HIGHLY HAZARDOUS MATERIAL AUDIT

SEATTLE PLANT
MAY 15, 1985

860294

MONSANTO INDUSTRIAL CHEMICALS COMPANY
Seattle Plant
Seattle, Washingtn
July 21, 1983

Spill Prevention Control and Countermeasure Plan

Distribution:

Copy	Location	Copy	Location
1	Plant Manager	11	TSD Engineer
2	Maintenance Supervisor	12	Chief Operator, Vanillin
3	Production Superintendent	13	Chief Operator, Vanillin
4	Assistant Production Supervisor	14	Chief Operator, Vanillin
5	Assistant Production Supervisor	15	Chief Operator, Vanillin
6	Production Engineer	16	Distribution Center Supv.
7	TSD Superintendent	17	Distribution Area Room
8	Plant Accountant & Purchasing Agt.	18	Chief of Maintenance
9	Environmental/Industrial Hygienist	19	B.J. Gilhousen - St. Louis
10	TSD Engineer	20	District #1 Fire Dept.

MONSANTO INDUSTRIAL CHEMICALS COMPANY
Seattle Plant
Seattle, Washington

Spill Prevention Control and Countermeasure Plan

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MONSANTO INDUSTRIAL CHEMICALS COMPANY
Seattle Plant
Seattle, Washington

Spill Prevention Control and Countermeasure Plan

Part 112: Oil Pollution Prevention from Non-Transportation Related Facilities

I. Purpose

The purpose of this plan is to describe the methods, equipment and facilities used by the Seattle Plant, Monsanto Industrial Chemicals Company, to prevent discharge of oil into or upon the navigable waters of the United States, specifically the Duwamish Waterway in the vicinity of Seattle, Washington. This plan is prepared in compliance with Title 40, Code of Federal Regulations, Chapter I, Sub-chapter D, Part 112, published by the Environmental Protection Agency in the Federal Register, on Tuesday, December 11, 1973, Volume 38, Number 237, Part 11, titled "Oil Pollution Prevention, Non-transportation Related Onshore and Offshore Facilities".

II. Policy

It is the policy of the Seattle Plant of Monsanto Industrial Chemicals Company to discharge to the environment, either directly or indirectly, only those materials whose discharge is permitted by federal, state and local laws and regulations. This policy is dictated by a desire to protect the environment in which we must live and work, and to maintain a good working relationship with regulatory agencies.

III. Definitions

A. Plant

The Monsanto Industrial Chemicals Company plant located at 9229 East Marginal Way South, Seattle, Washington. Phone 764-4450.

B. Spill

The uncontrolled and/or unintentional discharge of oil upon the plant site ground or into the waters of the Duwamish Waterway.

III. Definitions (Cont.)

C. Process Sewer

That portion of the plant sewer system which is pumped to the Municipality of Metropolitan Seattle's sewer system. Appendix 1a. shows the entire process system in the plant.

D. Sanitary Sewer

This system handles the plant's sanitary sewage and joins the process sewer at the Metro pump station. Appendix 1b. shows the entire sanitary sewer system in the plant.

E. Duwamish Outfall

That portion of the plant sewer system which flows by gravity to the Duwamish River. This system handles only clean water streams from rainwater run-off, cooling tower blowdown, and some once-through city water used for cooling purposes. In addition, a portion of the rainwater runoff flows by gravity to slip 6. All field drains are marked with tags reading "River Clean". Appendix 1C shows the Duwamish Outfall sewer system within the plant.

F. Containment

Means the surrounding of spilled material by a barrier which prevents its escape to the Duwamish River or the process system. Such a barrier might be a tank farm dike wall, or a berm of earth pushed up around materials spilled on open ground areas.

G. Recovery

Means the reclaiming by picking up with a pump, shovel, vacuum truck, etc., materials spilled and/or contained.

H. Oil

Means oil of any kind or in any form, including but not limited to No. 2 fuel oil, PS 300 fuel oil, Peneteck white distilling oil, lubricating oil, and antifoam agents carried in an oil base. The term oil does not include Toluene and Isopropanol.

IV. Site Configuration

Appendix 1, 2 & 3, are maps of the Seattle Plant. These maps show the Duwamish sewer system, the process sewer system, the sanitary sewer system, buildings, production facility structures, and tankage. Tank No. 1 is a 10,000 gallon tank used to store Peneteck white distilling oil. Tank Nos. 2 and 3 are 11,000 gallon tanks, Tank No. 4 is a 40,000 gallon. All are used to store No. 2 fuel oil or PS 300 fuel oil. No other plant tankage falls within the purview of this plan.

V. Preventive Facilities

A. Offshore Facilities

No offshore facilities are used since oil is not handled from the water side of the plant.

B. Onshore Facilities

Tank Nos. 1, 2, 3 & 4 shown on the maps in Appendix 1 are surrounded by concrete dikes which have concrete floors in them. The diked areas are capable of containing the spilled contents of the largest tank. Four of these bulk oil storage tanks are filled manually from either tank trucks or tank cars. An operator is present during the filling operations to insure the tanks are not overflowed.

C. Diversion/Containment Facilities

The plant has the capability to divert the Duwamish outfall and/or the process sewer to a 160,000 gallon containment reservoir. This system is to be used if an oil spill has reached a process sewer or "river-clean" area drain.

Manual diversion of each system is controlled by a single switch. Air pressure or electrical failure results in an automatic diversion condition for both sewer systems.

VI. Bulk Storage Tanks

A. The materials of construction of tanks, pipes, pumps, heat exchangers, and other equipment associated with bulk storage tanks, are mild steel and bronze. These materials meet all applicable construction codes.

B. Tanks are diked as indicated in Paragraph V above.

C. Spillage into a diked area may be recovered by use of mobile positive displacement pumps kept on hand for this purpose. Normally, spillage into the diked area will be recovered into a tank from which water and other contamination can be decanted; oil is returned to the storage tank.

D. The presence of operators and maintenance personnel in the vicinity of these facilities on a daily basis makes inspection and leak detection an on-going function. Formal records of inspections will be kept as part of a new vessel inspection program being instituted by the plant, but repairs are performed as necessary.

VI. Bulk Storage Tanks (Cont.)

E. Condensate from steam coils used to heat these tanks is blown to the atmosphere within the dike around the tank.

F. The tanks contain neither level control nor level alarm devices, as they are filled manually. An operator is present during all filling operations.

G. As indicated above, maintenance is performed routinely to correct leaks from any portion of the system, or from the tanks themselves.

VII. Transfer Systems

White oil is transferred from Tank No. 1 to the oil still pots by Pump 1-595 via a liquid controls meter which has an automatic meter and shut-off system. The operator in the oil still area opens the valves to admit oil to the proper still, sets the meter dial to the amount of oil desired, and starts the pump from his location in the oil still area. When the meter has counted down the appropriate number of gallons of oil, it automatically closes the valve and shuts off the pump. The pump cannot be restarted without resetting the meter. Manual valves admitting the oil to the stills are closed immediately after each transfer, negating the possibility of someone starting the oil pump from the oil tank location, and pumping more oil into the stills.

Fuel oil is transferred from bulk storage directly to the steam boilers. Since the oil must be fed under pressure, any failure of the pumping system or leak in the piping would result in low oil pressure and an automatic shutdown of the boilers, alerting appropriate operating or maintenance personnel to the problem.

VIII. Tank Car and Tank Truck Unloading

White oil is received in tank cars only, and fuel oil is received by tank truck only. Unloading facilities for white oil include a flexible hose connection from the tank car to the plant installed pump, and piping from the pump into the bulk storage tank. Each time a tank car of oil is received, an operator measures the tank level to insure that it will receive the entire contents of the tank car of white oil. This accomplished, a hose is hooked up, valves set in the proper position, pump unlocked, and pumping initiated. At approximately fifteen-minute intervals, the operator checks the tank to insure that the level is rising appropriately. Upon completion of pumping, the operator closes appropriate valves, disconnects the flexible hose over a bucket to catch any drips or spills which may occur from the line, and closes the valve on the bottom of the car to insure that no drips can occur from the car.

VIII. Tank Car and Tank Truck Unloading (Cont.)

Fuel oil unloading is accomplished in a similar manner, except that pumps on the tank trucks are used to pump the oil into the bulk storage tanks. The operator guages both fuel oil tanks to insure that there is enough capacity to receive the full tank truck shipment. Valves are opened to allow fuel oil tanks to equalize so that oil pumped into either will flow into both. Flexible hose connection is made, appropriate valves opened, and the truck operator is given instructions to commence pumping. Once again, the operator will observe the level in the tanks at approximately fifteen-minute intervals to insure that the levels are rising appropriately. As the level approaches the top of the tank, he makes a steady observation of the fuel oil level in the tank to insure that tanks are not overflowed. When the load has been transferred, he closes appropriate valves, including the valve at the end of the unloading line, closes the valve on the truck and drains the flexible hose into a catch pan or drum, insuring that none is spilled on the ground. Hose, truck or rail car failure resulting in any spilled material during unloading is drained to a sump with a 10,000-gallon capacity installed for that purpose.

IX. Inspections and Records

Inspection of oil storage and handling facilities will be made by area operators and/or maintenance personnel at the time of each monthly housekeeping and safety inspection. A written record that these systems have been inspected will be made by the person completing the inspection. The Maintenance Supervisor will receive these records and retain them for a period of three years.

X. Security

Access to the plant site is regulated by a guarded gate during the daytime and by a television remote control gate and car access system at other times and on weekends. Only personnel authorized to be on the plant site have access to the oil handling and storage equipment within the plant.

Starter controls for all oil pumps shall be switched to the "off" position in the motor control center from which the pump receives power. Only those personnel actively engaged in unloading oil into bulk storage will be authorized to return the starter control to the "on" position.

The unloading connection for both white oil and fuel oil will be securely capped with Kamlok caps and/or blank flanges whenever unloading is not in progress.

Lighting in the area of oil storage, oil unloading and oil handling systems is adequate for the purposes of discovery of spills, leaks, or mechanical malfunctions during hours of darkness.

XI. Personnel, Training, and Spill Prevention Procedures

All supervisors on the Plant Manager's staff will receive copies of this Spill Prevention Control and Countermeasure Plan. These supervisors will be responsible for insuring that their operating personnel are briefed on the provisions of this plan and are knowledgeable about its operation.

The TSD Superintendent is accountable for oil spill prevention and responsible for updating this plan as necessary.

Spill prevention and pollution control briefings will be scheduled and conducted at least annually by the TSD Superintendent for all personnel within the plant. These briefings will highlight and describe known spill events, failures, malfunctioning components, and any new precautionary measures.

XII. Notification Procedures

A. By Discoverer

An oil spill of any size will require immediate notification of the Area Operator and the Chief Operator.

B. By Chief Operator

A spill of five gallons or more which enters either the Metro sewer or the Duwamish River sewer system will require the Chief Operator to act in a responsible and timely manner to:

1. Analyze the seriousness of the spill regarding the environment.

2. Notify the TSD Superintendent and apprise him of the situation. If he cannot be located quickly, notify in order of preference the Production Superintendent, Production Engineer, Assistant Production Supervisors, Maintenance Supervisor, any TSD engineer, the Plant Manager or the Plant Accountant. Phone numbers are listed in Appendix 2. If the Chief Operator cannot locate any of the above supervisory personnel, he must assume control and take the actions listed below, which he considers appropriate.

3. Initiate appropriate corrective actions as details in Pharagraph XIII of this plan.

C. By Supervisory Personnel

Notification of the Plant Manager or his designated representative will be required by any spill which enters the Duwamish River system or by any spill which is large enough that it actually is pumped out of the Metro sewer sump. Notification of D.O.E. must be made for any spill entering the Duwamish River. Notification of Metro must be made for any spill entering the Metro sewer system. Notification of King County Fire District #1 should be made if a flammable material is involved. In addition, notification of the following agencies should also be considered, depending on the size, location, hazard, etc. of the spill:

XIII. Notification Procedures

C. By Supervisory Personnel (Cont.)

1. State Department of Ecology
2. Metro (Industrial Waste Section)
3. Metro (West Point Treatment Plant)
4. Coast Guard
5. Environmental Protection Agency
6. U.S. Army Corps of Engineers
7. King County Office of Emergency Services
8. King County Fire District #1

Notification of the authorities should be preceded by notification of the Plant Manager. If this is not possible, the supervisor in charge must make those notifications he considers necessary. In notifying authorities, the time, cause, location, type of material, hazard involved, estimated general magnitude of the spill, environmental conditions, and the corrective measures being taken, should be reported. Phone numbers are shown in Appendix 3.

D. By Plant Manager

Notification of Monsanto management and all news media shall be reserved to the Plant Manager.

XIII. Corrective Actions

A. General

The first consideration in the event of a spill of any size shall be the safety of personnel and protection of plant property. Procedures spelled out in the plant Safety and Property Protection Manual should be observed. Administration of first aid and fire fighting or fire prevention activities take priority over corrective actions detailed in this Plan. However, notification and corrective actions under both plans can and should be accomplished simultaneously.

B. Specific Corrective Actions

Table 1 details those actions which may be appropriate to a spill of a given material. This table is intended as a guide to the person in charge who must decide what actions will minimize the effects of the spill. That person will generally be the supervisor indicated in Paragraph XII.C. above.

XIII. Corrective Actions

B. Specific Corrective Actions (Cont.)

When the immediate application of one or more of the actions shown in Table 1 will contain the spill and keep it from reaching the Duwamish or the Metro sewer, however; that action should be taken by the Chief Operator, or even the Area Operator, pending notification of supervisory personnel.

C. Containment

Containment of an oil spill results in environmental protection as well as in the recovery and re-use of valuable materials. The physical and chemical nature of the material will dictate containment methods.

1. Diked Areas - Designed to contain the spilled contents of the largest tank inside the dike.

2. Undiked Areas - In unpaved areas, or even around paved areas, an earth dike can be pushed up with the plant tractor if time and the rate of spillage permits. A small or medium spill can often be diverted to a more desirable area for containment by such a dike or by a ditch.

3. Spills into the Duwamish - Large spills of oil can be contained in the Duwamish River by surrounding with an oil barrier or a boom of logs, or some similar booming method. Organizations who have booms on hand or can assist in containment and clean-up of oil spills are listed in Appendix 4.

D. Recovery

Recovery of spilled materials should always be attempted. The plant has two electric powered gear pumps, and several air-operated diaphragm pumps, capable of pumping a large volume of material. There are several points at which entry can be gained to the oil storage system, so that recovered materials can be returned to the process. The plant has on hand several hundred feet of two- and three-inch rubber hose which is compatible with the oil products used in the plant.

Rental pumps, electric, gas engine and air powered, are available from rental agencies nearby, and can be acquired on very short notice. Appendix 5 lists phone numbers, addresses and types of equipment available on a rental basis.

ACTION \ MATERIAL		Sulfuric Acid (Con) Sulfuric Acid (Dilute)	Caustic Soda (50%) Caustic Soda (Dilute)	Spent Caustic Wash Autoclave Liquor	Stripped IPA Raffinate Total Raffinate	Sodium Hydrosulfide Sodium Bisulfite	Spent Sulfite Liquor Isopropanol (IPA)	IPA Extract Stripped IPA Extract	Copper Sulfate	Nonsize Nonsize	Pydraul	Lube Oil Antifoam Agents	White Oil Fuel Oil	Toluene Toluene Extract
Follow S&PP Procedures	S													
	M						ALL SPILLS							
	L													
Follow Notification Procedures	S													
	M						ALL SPILLS							
	L													
Stop Spill/Leak at Source if possible	S													
	M						ALL SPILLS							
	L													
Manually divert process sewer into the containment pit	S	X		X	X X	X	X	X	X	X X	X	X	X X	X X
	M	X X		X	X X	X	X	X	X	X X	X	X X	X X	X X
	L	X X		X	X X	X X	X	X	X	X X	X	X X	X X	X X
Manually divert Duwamish outfall	S	X	X	X	X X	X X	X		X	X X	X	X X	X X	X X
	M	X X	X X	X X	X X	X X	X X	X X	X	X X	X	X X	X X	X X
	L	X X	X X	X X	X X	X X	X X	X X	X	X X	X	X X	X X	X X
Stop Metro sump pump	S													
	M								X		X	X X	X X	X X
	L								X		X	X X	X X	X X
Pump into raffinate	S													
	M		X X	X X	X X	X								
	L		X X	X X	X X									
Pump into temporary storage	S													
	M													
	L	X X	X	X		X	X X	X			X	X X	X X	X X
Flood area with water	S					X	X	X						
	M		X			X	X	X						
	L		X X			X	X	X						
Spread oil absorbent or Petro-Pak on surface	S											X X	X X	X X
	M											X X	X X	X X
	L													
Neutralize with caustic (carefully)	S	X X												
	M	X X												
	L	X X												
Neutralize with acid (carefully)	S		X X			X								
	M		X X											
	L		X X											

*CAUTION: Never add acid to this spilled material. Mixing of acid and sodium hydrosulfide (NaSH) or sodium bisulfite will produce a poisonous gas.

XIII. Corrective Actions

D. Recovery (Cont.)

Mobile storage can be provided in case of an emergency by contacting the trucking firms which we use to move acid, Mersize, oil and other chemicals. Their numbers are also listed in Appendix 5.

There is an excellent chance at any given time we may have an empty railroad tank car in the plant which could be used for temporary storage of spilled materials. Others could be obtained by contacting the railroad agencies in Seattle.

Other possibilities certainly exist. The success of efforts to minimize the effects of a spill will depend upon the ability of each person to think clearly and take decisive action in a timely manner.

XIV. Revisions

From time to time, or as required by the EPA or another regulatory agency, this plan will be updated to include improvements in spill control made by the plant, or changes required in the plan. The TSD Superintendent will be responsible for insuring that the plan is current and will review it annually in July.

TSD Superintendent

MONSANTO INDUSTRIAL CHEMICALS COMPANY
Seattle Plant
Seattle, Washington

Spill Prevention Control and Countermeasure Plan

Part 265: Operations of Hazardous Waste Storage Facility

I. Purpose

The purpose of this plan is to describe the methods, equipment, and facilities used by the Seattle Plant, Monsanto Industrial Chemicals Company, to minimize hazards to human health or environmental from any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water.

II. Policy

It is the policy of the Seattle Plant of Monsanto Industrial Chemicals Company to discharge to the environment, either directly or indirectly, only those materials whose discharge is permitted by Federal, State and Local laws and regulations. Provisions of this contingency plan will be carried out immediately whenever there is a release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

III. Definitions

A. Plant

The Monsanto Industrial Chemical Company Plant is located at 9229 East Marginal Way South, Seattle, Washington. Phone (206) 764-4450.

B. Spill

An unplanned sudden or non-sudden release of a hazardous waste or constituents of a hazardous waste to the air, soil, or surface water at the facility.

C. Superfund Spill

A sudden, accidental, or episodic release of a reportable quantity (RQ) of hazardous substance to the soil or surface water of the facility.

Hazardous Substance	Reportable Quantity
Copper Sulfate	10
Sodium Hydrosulfide	5,000
Sodium Hydroxide	1,000
Sulfuric Acid	1,000
Sodium Bisulfite	5,000
Toluene	1,000

III. Definitions (cont.)

D. Hazardous Waste

A hazardous waste is defined as material having a pH above 12 or below 2. For purposes of this plan only strainer solids and a spill of one of our products, Vanillin Black Liquor Solids (VBLS), fall under this definition.

E. Containment

Containment means the surrounding of spilled material by a barrier which prevents its escape to the air, soil or ground water at the site. Such barriers might be a leachate collection system, tank farm dike wall, or a berm of earth pushed up around spilled material.

IV. Preventative Facilities

The plant has installed a concrete containment pad, with retaining wall and leachate collection system. Facility is indicated at point 5 on appendix 6. All plant hazardous waste is stored at this facility while awaiting transfer to an approved landfill. Leachate is returned to the plant process on an as needed basis using an automatic pumping system.

V. TSD Repair Plan

The TSD storage facility is constructed of 1 foot of 5000 lb reinforced concrete. It has been designed to withstand vehicle traffic and maintain its integrity during zone 3 intensity earthquake.

The facility should be surveyed by on-site observation once per month.

VI. Action Plan

The Plant's hazardous waste is in a solid form. There is little chance of unplanned release. The plant's contingency plan addresses the leachate and/or mud resulting from the storage of these solids.

The leachate and/or mud is normally contained within the collection system provided. The level is checked by a float switch and pumped automatically to the plant process as necessary.

In the event that the capacity of the collection system pump and storage pad is exceeded and a spill occurs, the following action is to be taken:

A. By Discoverer

Immediately notify Chief Operator.

B. By Chief Operator

Dispatch discoverer and helper to the site with equipment to pump the leachate and/or mud to the plant process through the sewer pump out station located by the northwest of the D.C.

Dispatch two or more people with shovels to put a temporary berm around the spill.

Notify emergency cordinator as listed in Part VII.

C. By Emergency Coordinator

Notification of appropriate agencies and Plant Manager, should the spill reach the Duwamish River or qualify as a Superfund spill.

A prioritized list of agency phone numbers may be found in appendix 3.

VII. Emergency Coordinator

The following is a list of people qualified to act as emergency coordinator in case of a hazardous waste release. The TSD Superintendent is the primary emergency coordinator, others are listed in the order in which they will assume responsibility as alternates:

1.	TSD Superintedent - M.N. Miller	work: 764-4481 home: (b) (6)
2.	Production Superintendent - B.E. Pallante	work: 764-4472 home (b) (6)
3.	Production Engineer - G.L. Podrabsky	work: 764-4465 home: (b) (6)
4.	Assistant Production Supv. - F.H. Emme	work: 764-4453 home: (b) (6)
5.	Assistant Production Supv. - T.B. Rahier	work: 764-4478 home: (b) (6)
6.	Senior Chemist, Environmental and Industrial Hygienist - S.E. Hays	work: 764-4474 home: (b) (6)
7.	Plant Mnage - R.E. Rhoades	work: 764-4484 home: (b) (6)

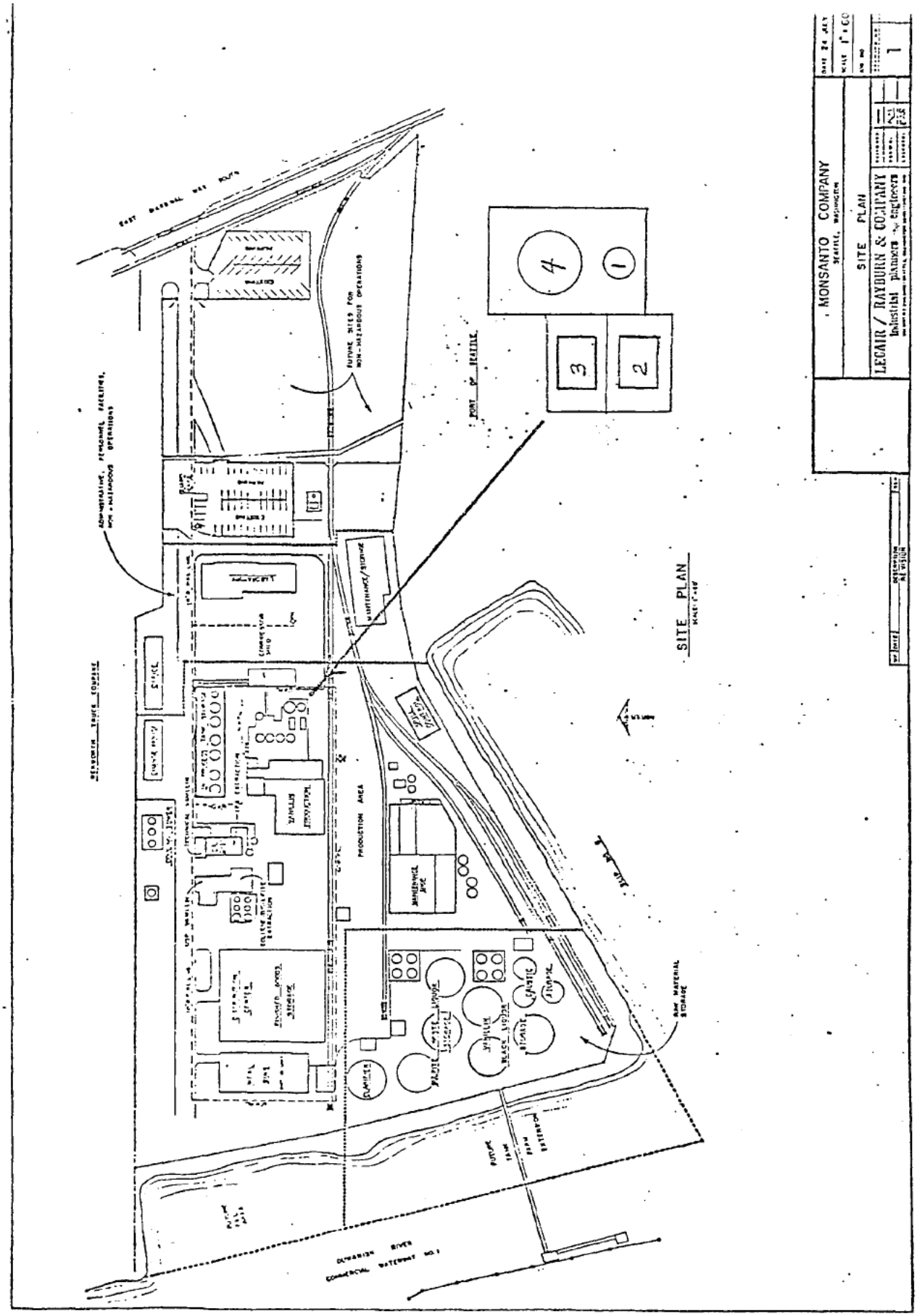
VIII. Emergency Equipment

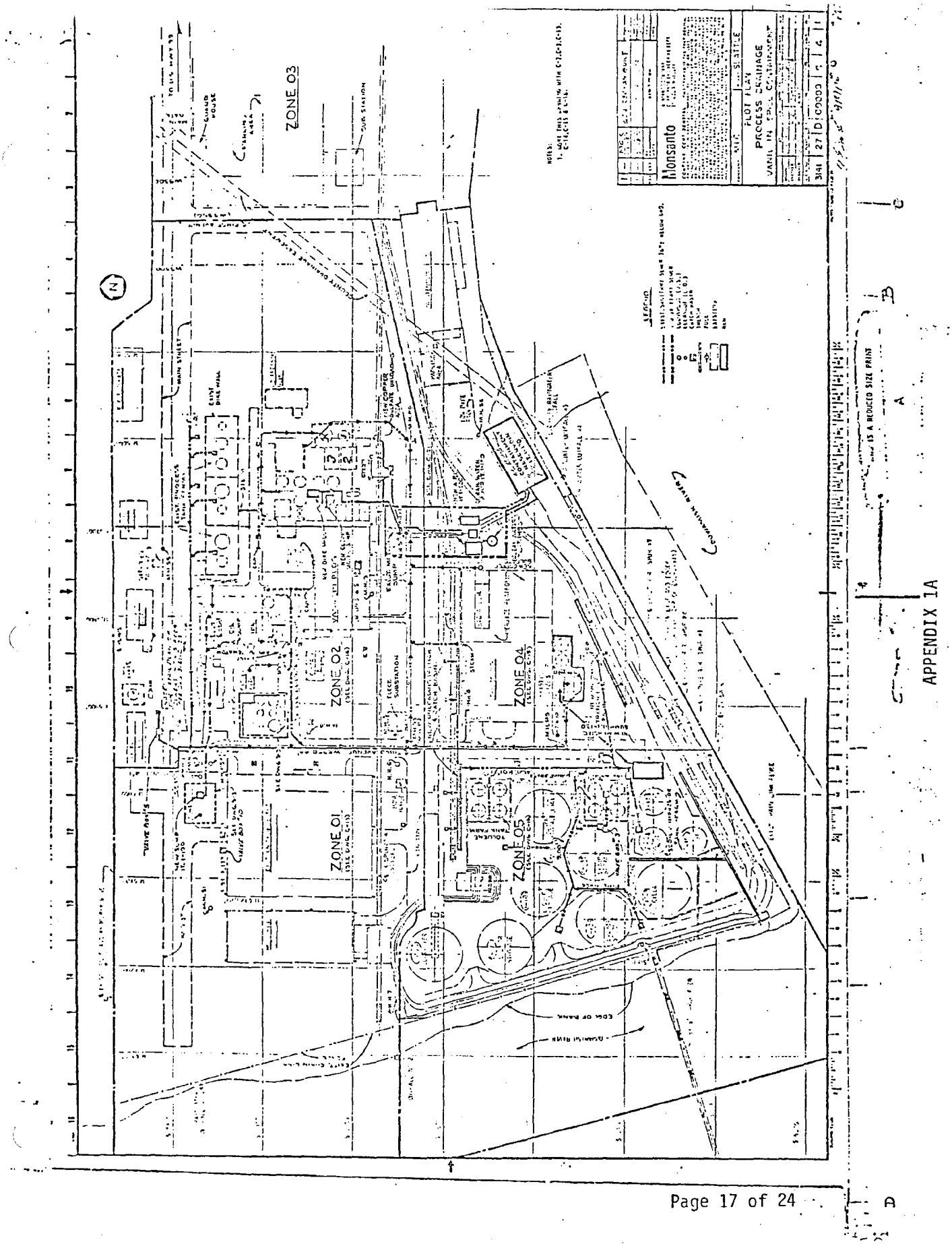
2" Warren-Rupp "Sandpiper" air operated diaphragm pump. All stainless steel with Viton diaphragms. Maximum air pressure 125 psi. Maximum capacity 200 gllons per minute (located in maintenance shop).

500 gallon portable stainless steel tank with dip pipe and flame arrester (can be pulled by either forklift).

Miscellaneous shovels, sandbags, etc. (located in plant maintenance shop).

IX. Revisions


MONSANTO COMPANY
SEATTLE, WASHINGTON
SITE PLAN
LEGAIR / RAYBURN & COMPANY
Industrial planners - engineers
SITE PLAN
PRODUCTION AREA
RAW MATERIAL STORAGE
FUTURE SITES FOR NON-HAZARDOUS OPERATIONS
ADMINISTRATIVE, PERSONNEL FACILITIES, NON-HAZARDOUS OPERATIONS
DUWAMISH RIVER
COMMERCIAL WATERWAY NO. 1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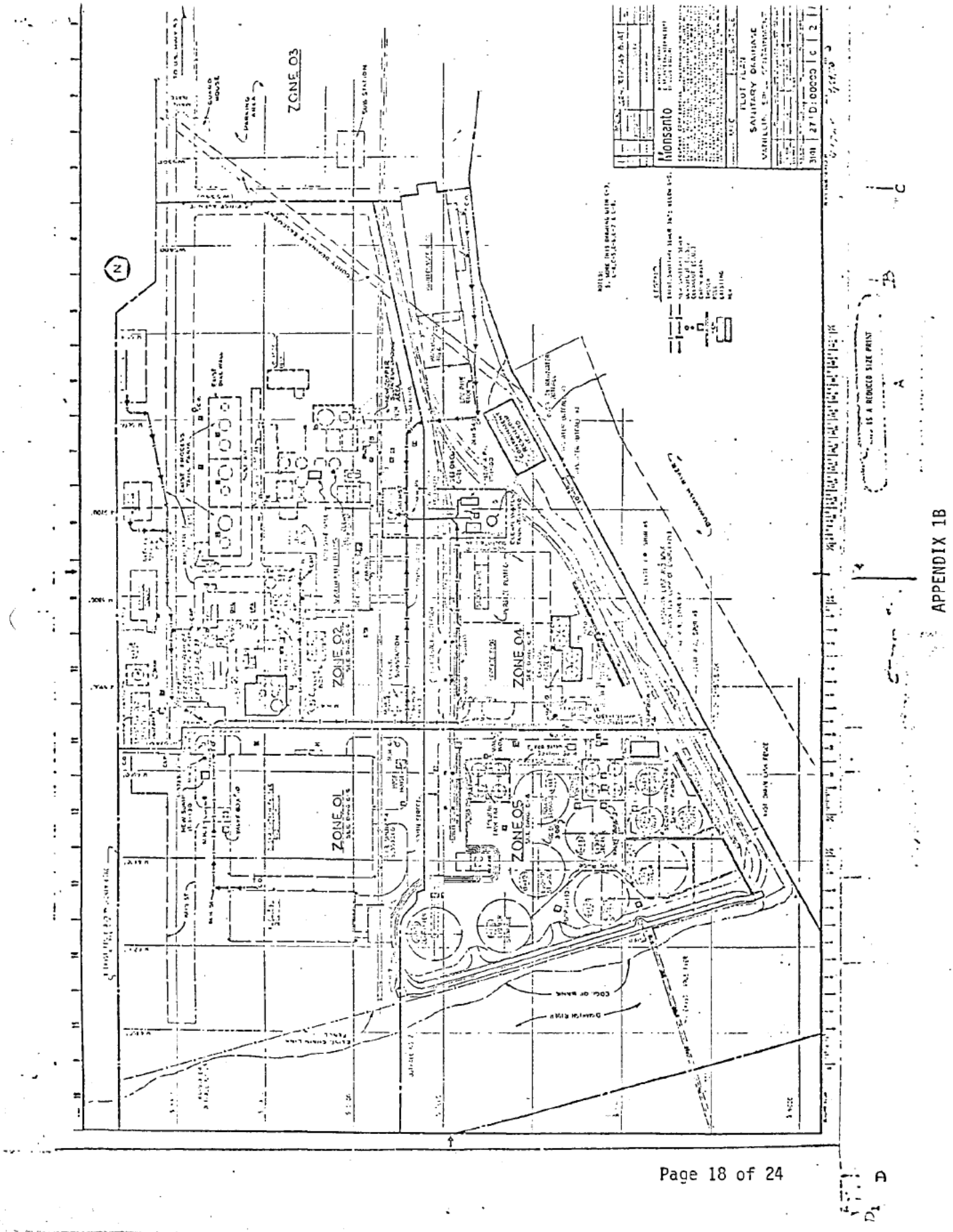
ZONE 02
ZONE 03
ZONE 04
ZONE 05
Monsanto
PLOT PLAN
PROCESS DRAINAGE
APPENDIX 1A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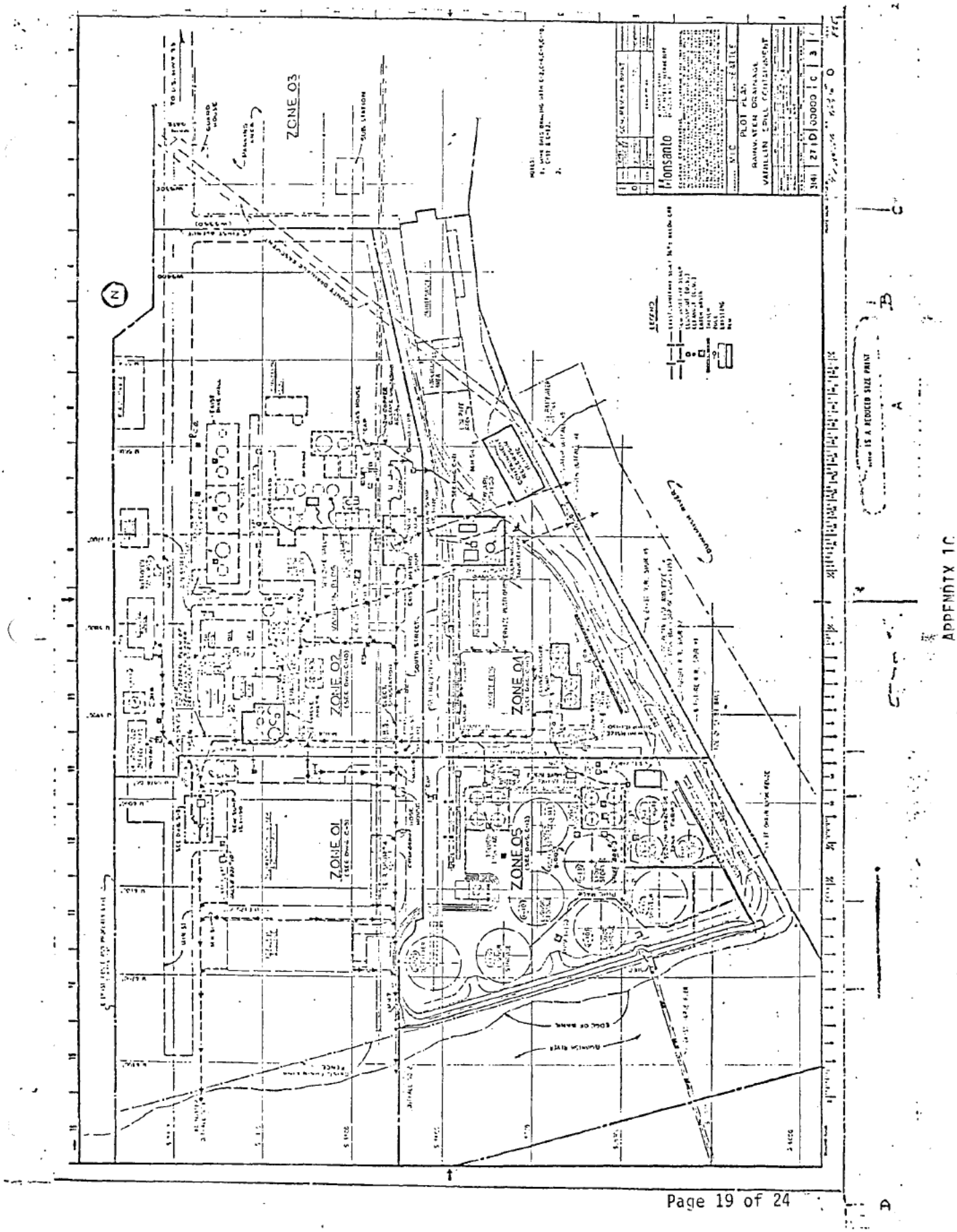
ZONE 02
ZONE 03
ZONE 04
ZONE 05
Monsanto
FLOT PLAN
SANITARY DRAINAGE
VANILLIN PLANT
APPENDIX 1B


ZONE 03
ZONE 02
ZONE 04
ZONE 01
ZONE 05
Monsanto
PLOT PLAN
APPENDIX 1C

APPENDIX 2

SUPERVISORY PERSONNEL NOTIFICATION LIST

Position	Name	Phone
1. TSD Superintendent	M.N. Miller	641-8387
2. Production Superintendent	B.E. Pallante	1-952-3465
3. Production Engineer	G.L. Podrabsky	362-4197
4. Assistant Production Supv.	F.H. Emme	778-4249
5. Assistant Production Supv.	T.B. Rahier	226-3945
6. Maintenance Supervisor	R.H. Bleikamp	788-4875
7. TSD Engineer	T.A. Kong	885-6506
8. TSD Engineer	T.R. Kwapien	542-3775
9. Plant Manager	R.E. Rhoades	271-9506
10. Plant Accountant	S.P. Whittaker	941-2074

APPENDIX 3

GOVERNMENTAL AUTHORITIES NOTIFICATION LIST

Agency	Phone Days	Phone Night/Weekends
Washington State Department of Ecology		
Mike Dawda	885-1900	
Bob McCormick - Regional Manager		232-2869
Metro (Industrial Waste Section)	447-6743	622-1628
Metro (West Point Treatment Plant)	447-6803 (24 hours)	
National Response Center (spills to Duwamish River and hazardous recordable quantity spills only)	800-424-8802 (24 hours)	
U.S. Coast Guard	442-7070	442-7070
King County Fire District #1 (Business)	762-3330	762-3330
(Dispatch)	852-2121	852-2121
Environmental Protection Agency	442-1263	442-1200
U.S. Army Corps of Engineers	764-3690	764-1628
King County Office of Emergency Service - Emergency Only	344-3830	344-4980
King County Sheriff - Emergency Number	344-4080	

APPENDIX 4

ORGANIZATIONS CAPABLE OF EMERGENCY ASSISTANCE

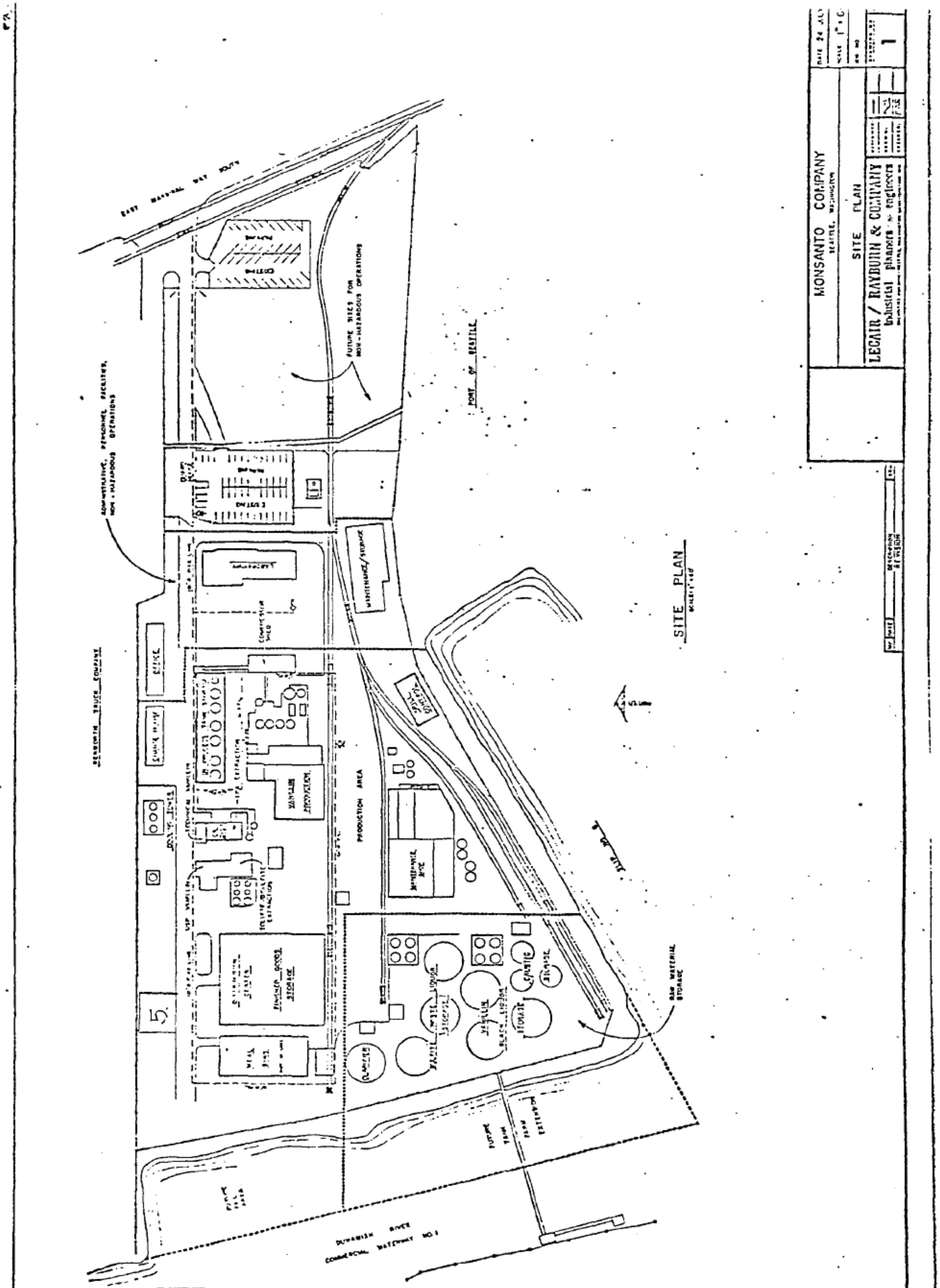
ORGANIZATION	PHONE	CAPABILITIES
Crosby & Overton 3406 - 13th S.W. Seattle, WA.	622-3400	Oil spill clean-up, sludge removal, tank trucking.
Foss Launch & Tug Co. 660 West Ewing Seattle, WA.	281-3800 *281-3810	Log booming equipment; barges available to provide temporary floating storage.
Chem Security P.O. Box 1866 Bellevue, WA.	872-0711	Disposal service for waste materials via Arlington, OR.
Pioneer Towing Co. 6423 N.E. 175th Kenmore, WA.	525-3030	Log booming equipment.
Crowley Environmental Svcs. 3400 E. Marginal Way So. Seattle, WA.	682-4898	Emergency pollution control for spill clean-up on land or water.
Northwest Tank Service 1500 Airport Way So. Seattle, WA.	622-1090	Oil spill clean-up, sludge removal, tank trucking.
Chemical Processors Inc. 5501 Airport Way So. Seattle, WA.	767-0350	Chemical waste recyclers

* After hours numbers, for emergency use only.

APPENDIX 5

EQUIPMENT AVAILABILITY LIST

COMPANY	PHONE	EQUIPMENT
Hertz Equip. Rental & Leasing 10710 E. Marginal Way South Seattle, WA.	(206)762-1863	Pumps, compressors, generators, trucks, loaders, backhoes, etc.
Star Rentals 1919 - 4th Ave. So. Seattle, WA.	(206)622-7880	Pumps, compressors, generators, etc.
Case Power & Equip. Co. 5701 - 1st Avenue So. Seattle, WA.	(206)762-7110	Bulldozers, backhoes, loaders, earth moving equipment, etc.
Inland Transportation Co. 6737 Corson St. Seattle, WA.	(206)767-3605	Tank trucks, flat beds.
Secured Resource Transport 12486 S.E. 93rd Clackmas, OR	(503)653-5222	Flat bed, dump trucks.
N.C. Machinery Co. 17025 W. Valley Highway Seattle, WA.	(206)251-5800	Bulldozers, backhoes, loaders, earth moving equipment, etc.


MONSANTO COMPANY
SEATTLE, WASHINGTON
SITE PLAN
LECAIR / RAYBURN & COMPANY
industrial planners & engineers
SITE PLAN
FUTURE SITES FOR NON-HAZARDOUS OPERATIONS
ADMINISTRATIVE, PERSONNEL FACILITIES, NON-HAZARDOUS OPERATIONS
PORT OF SEATTLE
PRODUCTION AREA
MAINTENANCE/STORAGE
VANILLIN PRODUCTION
FINISHED GOODS STORAGE
OFFICE
RAW MATERIAL STORAGE
DUWAMISH RIVER
COMMERCIAL WATERWAY NO. 1

APPENDIX III

M S D S

SPECIFICATIONS

RAW MATERIALS

Calcium Stearate
Copper Sulfate
Isopropyl Alcohol
Calcium Lignosulfonate
Nitrogen
Peneteck Oil
Sodium Bisulfite
Sodium Hydrosulfide
Sodium Hydroxide
Sodium Sulfite
Sulfuric Acid
Toluene
Versene

PRODUCTS/CO-PRODUCTS

Vanillin
Vanillin Black Liquor (VBL)
Vanillin Black Liquor Soldis (VBLS)
Vanillin Still Bottons (VSB)

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME: SYNTHETIC PRODUCTS COMPANY	EMERGENCY TELEPHONE NO.: 216-531-6010
ADDRESS (Number, Street, City, State, and ZIP Code): 1636 Wayside Road, Cleveland, Ohio 44112	
CHEMICAL NAME AND SYNONYMS: Calcium Stearate	TRADE NAME AND SYNONYMS: Type 24-46
CHEMICAL FAMILY: Fatty Soap	FORMULA: $Ca(C_{18}H_{35}O_2)_2$

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS: Calcium Stearate	100				

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	Decomposes	SPECIFIC GRAVITY (H_2O=1)	1.0
VAPOR PRESSURE (mm Hg.)	Nil	PERCENT, VOLATILE BY VOLUME (%)	2.5
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____ =1)	Nil
SOLUBILITY IN WATER	Negligible		
APPEARANCE AND ODOR	White powder, mild fatty odor		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	500°F COC	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA	Water, CO_2, foam, dry chemicals			
SPECIAL FIRE FIGHTING PROCEDURES				
UNUSUAL FIRE AND EXPLOSION HAZARDS	As fine dust in air may be hazardous with ignition source			

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

EFFECTS OF OVEREXPOSURE

SKIN: Wash with soap and water

EYES: Flush with water

EMERGENCY AND FIRST AID PROCEDURES

INGESTION OR INHALATION: Consult physician

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	XX	

INCOMPATABILITY *(Materials to avoid)*: Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS: CaO, CO_2

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	XX	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Sweep up and discard; avoid inhalation of dust

WASTE DISPOSAL METHOD

As per usual solids disposal in keeping with local, state and federal regulations

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: Dust Mask

VENTILATION	LOCAL EXHAUST: To remove dust	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES

EYE PROTECTION: Chemical Goggles

OTHER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Store in dry cool area

OTHER PRECAUTIONS: Use good personal hygiene when handling, Avoid inhalation of dust

McCall Chemical Company of Canada, Lt

MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-O

PRODUCT NAME: COPPER SULFATE — PAGE 1

CHEMICAL NAME: — CHEMICAL FAMILY: COPPER COMPOUNDS

FORMULA: $CuSo4 \cdot 5H20$ — MOLECULAR WEIGHT:

SYNONYMS: COPPER SULFATE PENTAHYDRATE CRYSTALS

I. PHYSICAL DATA

BOILING POINT, 760 mm, Hg	215° F	FREEZING POINT	
SPECIFIC GRAVITY (H_2O = 1)	Typical 1.1800-1.1980	VAPOR PRESSURE AT 20°C	Less than 17.5mm Hg
VAPOR DENSITY (air = 1)	That of Water	SOLUBILITY IN WATER, % by wt. @20°C	24.5
PER CENT VOLATILES BY VOLUME	Water portion 75%	EVAPORATION RATE (Butyl Acetate = 1)	N/A
APPEARANCE AND ODOR	Clear Blue Crystal, no discernable odor		

II. HAZARDOUS INGREDIENTS

MATERIAL	%	TLV (Units)

III. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT [test method(s)]	NA	AUTOIGNITION TEMPERATURE	
FLAMMABLE LIMITS IN AIR, % by volume	LOWER		UPPER

EXTINGUISHING MEDIA	Copper Sulfate has fire retading properties
SPECIAL FIRE FIGHTING PROCEDURES	None
UNUSUAL FIRE AND EXPLOSION HAZARDS	None

EMERGENCY PHONE NUMBER

1 800 424-9300
CHEMTREC

While Great Western Chemical Co. believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests contained, the data are not to be taken as a warranty or representation for which Great Western Chemical assumes legal responsibility. They are offered solely for your consideration, investigation, and verification. Any use of these data and information must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.

THRESHOLD LIMIT VALUE	
EFFECTS OF OVEREXPOSURE	
EMERGENCY AND FIRST AID PROCEDURES	If Copper Sulfate gets in the eyes, wash immediately with copious amounts of water, followed by a mild eyewash. If Copper Sulfate gets on open wounds, or cuts, wash with copious amounts of water.

V. REACTIVITY DATA

STABILITY			
UNSTABLE	STABLE	CONDITIONS TO AVOID	

INCOMPATIBILITY (materials to avoid)	
HAZARDOUS DECOMPOSITION PRODUCTS	

HAZARDOUS POLYMERIZATION			
May Occur	Will not Occur	CONDITIONS TO AVOID	

VI. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	Copper Sulfate is not hazardous to handle. Nevertheless, if it gets into the eyes it will cause severe irritation. It will also cause irriation if it comes in contact with-cuts or open wounds.
WASTE DISPOSAL METHOD	Sweep up and dispose of manner approved by local authorities.

VII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)		Dust respiratior		
VENTILATION	LOCAL EXHAUST		SPECIAL	
	MECHANICAL (general)		OTHER	
PROTECTIVE GLOVES		Plastic or rubber gloves	EYE PROTECTION	Clear goggles or fac Shield.
OTHER PROTECTIVE EQUIPMENT				

VIII. SPECIAL PRECAUTIONS

PRECAUTIONARY LABELING	
OTHER HANDLING AND STORAGE CONDITIONS	Store in dry location to prevent caking.

550 1 82

OMB No. 44-R1387

Occupational Safety and Health Administration

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
Van Waters & Rogers	800-424-9300

ADDRESS (Number, Street, City, State, and ZIP Code): 8201 South 212 Kent, Washington 98031

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Liquid Copper Sulfate	Blue Vitriol Solution
CHEMICAL FAMILY: Inorganic Salt	FORMULA: 27.6% $CUSO_4$ $5H_2O$, 72.4% H_2O

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS None			BASE METAL None		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
None		

SECTION III - PHYSICAL DATA

BOILING POINT (°F.) Approximate	212°	SPECIFIC GRAVITY (H_2O=1)	1.2094
VAPOR PRESSURE (mm Hg.)		PERCENT VOLATILE BY VOLUME (%) Weight	72.4%
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____ =1)	
SOLUBILITY IN WATER Infinate			
APPEARANCE AND ODOR Blue Liquid			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) None	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA			
SPECIAL FIRE FIGHTING PROCEDURES None			
UNUSUAL FIRE AND EXPLOSION HAZARDS None			

(Continued on reverse side)

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Rev. May 72

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	1 mg/m^3
EFFECTS OF OVEREXPOSURE	possibility of irritation
EMERGENCY AND FIRST AID PROCEDURES	
Flush area liberally with water	
Consult Physician	

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATABILITY *(Materials to avoid)*	No		
HAZARDOUS DECOMPOSITION PRODUCTS	Sulfur Trioxide above 653°C		
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Contain Spill, Mop up or soak up immediately
WASTE DISPOSAL METHOD
Remove to approved dumpsite following state & local regulations

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*	approved respirator		
VENTILATION	LOCAL EXHAUST	Yes	SPECIAL
	MECHANICAL *(General)*	Yes	OTHER
PROTECTIVE GLOVES	Yes	EYE PROTECTION	Yes
OTHER PROTECTIVE EQUIPMENT			

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid Spilling, use stainless steel systems
OTHER PRECAUTIONS

CONDITIONS CONTRIBUTING TO INSTABILITY

None known. Product is highly soluble in water, but does not react with the water.

MPATIBILITY

None known when product remains dry. Product readily dissolves in water. Solutions are corrosive to mild steel, Store solutions in plastic, rubber, 304, 347, or 316 stainless ste

HAZARDOUS DECOMPOSITION PRODUCTS

None at normal process temperatures and pressures. If dry heated above 1100° F (600° C) sulfur dioxide (SO_2) may be released.

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

None known.

VII DISPOSAL, SPILL OR LEAK PROCEDURES

AQUATIC TOXICITY ~~XXXXXXXXX~~ LC_{50} 24 hr = Daphnia magna = .182 mg/l. Rainbow trout = 0.17 mg Bluegill 1.5 mg/l. All values are expressed as copper sulfate pentahydrate. Test wate was soft.

WASTE DISPOSAL METHOD

Sweep up crystal or powdered product and dispose in an approved landfill. If product is in confined solution, introduce lime or soda ash to form insoluble copper salts and then dispose in an approved landfill.

PS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

1). Contact appropriate, local, State, or Federal pollution control officials if warranted and especially if spilled into public waters.

2). If spill is confined to the use site, neutralize with lime or soda ash and use absorbent and remove to approved landfill.

NEUTRALIZING CHEMICALS

Soda ash or lime.

VIII SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS

TWA = 1 mg/m^3 for all copper dusts and mists. If TWA exceeds this limit in workplace, appropriate ventilation should be provided, or respiratory protective equipment must be provided.

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY (SPECIFY IN DETAIL)

TWA = 1 mg/m^3 for all copper dusts and mists. If TWA exceeds this limit in workplace, respiratory protective equipment must be provided in accordance with Paragraph 1910.134 of Title 29, Code of Federal Regulatio

EYE

Chemical goggles should be worn when handling product.

OVES

Rubber gloves may be worn.

OTHER CLOTHING AND EQUIPMENT

No special protective clothing or equipment are required.

IX SPECIAL PRECAUTIONS

PRECAUTIONARY STATEMENTS

No special precautions are known other than those stated on the bag and in this Material Safety Data Sheet.

OTHER HANDLING AND STORAGE REQUIREMENTS

Store product in a dry place.

ADDITIONAL REGULATORY CONCERNS

FEDERAL:

FDA Is Generally Recognized as Safe (GRAS) as a mineral for livestock.

USDA

CPSC

TSCA IS THIS PRODUCT, OR ALL ITS INGREDIENTS; BEING CERTIFIED FOR INCLUSION ON THE TOXIC SUBSTANCES CONTRC INVENTORY OF CHEMICAL SUBSTANCES? Yes

OTHER Labelled and registered with EPA as a pesticide to control algae in water and roots in sewers.

STATE:

PREPARED BY Dr. Arthur F. Gohlke

TITLE: Technical Marketing Associate

COMPANY: TENNESSEE CHEMICAL COMPANY

ADDRESS: 553 CLARK AVE.
PITTSBURG, CA 94565-5099

1/5/79

Diamond Chemicals Company
350 Mt. Kemble Avenue
Morristown, New Jersey 07960

MATERIAL SAFETY DATA SHEET

1 Slight Health Hazard | 1 Slightly Combustible | 0 Nonreactive

Ratings based upon NIOSH "Identification System for Occupationally Hazardous Materials (1974)."

DEPARTMENT OF TRANSPORTATION INFORMATION

PROPER SHIPPING NAME: Not Applicable

HAZARD CLASS: Not Applicable

I PRODUCT IDENTIFICATION

Manufacturer's Name
DIAMOND CHEMICALS COMPANY

Regular Telephone No. 201/267-1000
Chemtrec Telephone No. 800/424-9300

Address
350 Mt. Kemble Avenue
Morristown, New Jersey 07960

Product Name
Defoamer 1119-A

II HAZARDOUS INGREDIENTS

Material or component	%	Hazard Data
Proprietary	100	*PEL: None Established

*OSHA Permissible Exposure Limit

III PHYSICAL DATA

Boiling Point, 760 mm Hg
Not Available

Melting Point
Not Applicable

Specific Gravity (H_2O=1)
0.99

Freezing Point
Not Available

Vapor Pressure
Not Available

Vapor Density (Air = 1)
Not Available

Solubility in H_2O, % by WT.
Poor, unstable dispersion

% Volatiles by Vol.
Nil

Evaporation Rate (Butyl Acetate = 1)
Not Available

Density at 20°C:
8.2 lb/gal

Appearance and Odor
Light yellow liquid

pH:
2%: 9.2

Viscosity
250 SUS at 100°F

IV FIRE AND EXPLOSION DATA

DEVELOP EMERGENCY ACTION PLAN

Flash Point (Test Method)
248°F (120°C) PMCC

Autoignition Temperature
Not Available

Flammable Limits in Air, %by Vol.

Lower
Not Available

Upper
Not Available

Extinguishing Media
Water spray, CO_2, dry chemical.

Special Fire Fighting Procedures
Cool exposed containers with water spray. Self-contained breathing apparatus in confined areas.

Unusual Fire and Explosion Hazard
Combustible Liquid

V HEALTH HAZARD INFORMATION

Routes of Exposure

Inhalation
No hazard expected under ordinary conditions of use.

Skin Contact
No hazard expected.

Skin Absorption
No hazard expected.

Eye Contact
No injury expected.

Ingestion
Considered practically non-toxic.

Effects of Overexposure

Acute Overexposure
Not expected to be toxic by any route of exposure.

Chronic Overexposure
No data.

Emergency and First Aid Procedures

Eyes:

Flush with large amounts of water for at least 15 minutes holding lids apart. Washing within one minute is essential to achieve maximum effectiveness. Get medical attention.

Skin:

Wash area with soap and water.

Inhalation:

Remove to fresh air.

Ingestion:

DO NOT induce vomiting. If vomiting should occur spontaneously, keep airway clear. Get medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician

None

VI REACTIVITY DATA

Conditions Contributing to Instability

None

Incompatibility

Strong oxidizing agents.

Hazardous Decomposition Products

CO and CO_2 on burning.

Conditions Contributing to Hazardous Polymerization

None

VII SPILL OR LEAK PROCEDURES

Steps to be Taken if Material is Released or Spilled

Stop leaks. Contain spills and collect for reuse, if possible. Soak-up remaining product with absorbent material and place in labeled waste container for disposal. Wear adequate personal protective clothing and equipment.

Waste Disposal Method

Landfill or incinerate in accordance with applicable Federal, State, and local regulations.

VIII INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation Requirements

Local exhaust ventilation recommended.

Specific Personal Protective Equipment

Respiratory (Specify in Detail)

Not required under normal use. NIOSH/MSHA approved respirator if necessary. Follow manufacturer's recommendation.

Eye
Chemical splash goggles or face shield.

Gloves
Rubber or plastic.

Other Clothing and Equipment
Standard work clothing and work shoes.

IX SPECIAL PRECAUTIONS

Precautionary Statements

CAUTION! MAY CAUSE IRRITATION

Avoid contact with eyes, skin or clothing.
Avoid breathing mist.
Wear chemical goggles, gloves and protective clothing when handling.
Use with adequate ventilation and employ respiratory protection where spray or mist may be generated.
Wash thoroughly after handling.

Other Handling and Storage Requirements
Product may congeal or stratify if cold. Warm to 122°F (50°C) and mix well before using.

'repared by: William J. Meyers DATE: September 16, 1983

All information recommendations and suggestions appearing herein concerning our product are based upon tests and data believed to be reliable. However, it is the user's responsibility to determine the safety, toxicity, and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied, is made by Diamond Chemicals Company as to the effects of such use, the results to be obtained, or the safety and toxicity of the product nor does Diamond Chemicals Company assume any liability arising out of use, by others, of the product referred to herein. The information herein is not to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

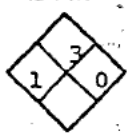
ADAPTED FROM USOL
FORM NO L58-005-4-MAY 1969

SHELL OIL COMPANY
SHELL CHEMICAL COMPANY
SHELL DEVELOPMENT COMPANY
SHELL PIPE LINE CORPORATION

MSDS 512-1

MATERIAL SAFETY DATA SHEET

HAZARD RATING



NFPA

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act of 1970 and shall not be used for any other purpose. Use or dissemination of all or any part of this information for any other purpose may result in a violation of law or constitute grounds for legal action.

SECTION I

MANUFACTURER'S NAME: Shell Chemical Company	EMERGENCY TELEPHONE NO.: 713-473-9461
ADDRESS (Number, Street, City, State, and ZIP Code): One Shell Plaza, P. O. Box 2463, Houston, Texas 77001	
CHEMICAL NAME AND SYNONYMS: Isopropyl Alcohol	TRADE NAME:
CHEMICAL FAMILY: Alcohol	FORMULA: CH_3 CHOH CH_3

SECTION II HAZARDOUS INGREDIENTS*

COMPOSITION	%	SPECIES	LD_{50} ORAL	LD_{50} DERMAL	LC_{50} CONCENTRATION	LC_{50} HOURS
PIGMENTS						
CATALYST						
VEHICLE						
SOLVENTS	100	Rat	4.0 gm/kg			
ADDITIVES		Rabbit		16.4 gm/kg		
OTHERS		Rat			>16,000 PPM	8

SECTION III PHYSICAL DATA

BOILING POINT (°F)	181	SPECIFIC GRAVITY (H_2O=1)	0.789
VAPOR PRESSURE (mmHg) @ 68°F	33	PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)	2.07	EVAPORATION RATE (NBAC ____ =1)	1.44
SOLUBILITY IN WATER	100%		
APPEARANCE AND ODOR	Colorless and mobile liquid. Somewhat unpleasant odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): 53°F TCC	FLAMMABLE LIMITS	Lel: 2.5	Uel: 12.0
EXTINGUISHING MEDIA: Fog, CO_2, dry chemical, alcohol foam			
SPECIAL FIRE FIGHTING PROCEDURES			
UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid.			

*Modified by Shell Oil Company

MSDS 512-1

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: 400 PPM

EFFECTS OF OVEREXPOSURE: Irritation of eyes, nose, throat. Headache, nausea, and dizziness.

EMERGENCY AND FIRST AID PROCEDURES: Remove victim to fresh air. Give artificial respiration if breathing has stopped. In case of eye irritation, flush eyes with water for 15 minutes; if irritation persists, get medical attention

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID: Fire, sparks.
	STABLE	X	

INCOMPATABILITY (Materials to avoid): Strong oxidizing agents, alkali metals, aluminum

HAZARDOUS DECOMPOSITION PRODUCTS: Will react with aluminum and give off hydrogen if the oxide film is penetrated.

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Flush spill away with water, avoid contact with fire or sparks. Wear respiratory protection.

WASTE DISPOSAL METHOD: Flush with water or controlled burning.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type): Air pack or organic canister.

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL (General): As required.	OTHER

PROTECTIVE GLOVES: Rubber

EYE PROTECTION: Goggles to prevent splashing in eyes.

OTHER PROTECTIVE EQUIPMENT

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: May be stored in steel tanks. Handle as flammable solvent.

OTHER PRECAUTIONS: May attack aluminum. Avoid skin contact to prevent defatting action. Normal good personal hygiene.

NAME: A. DeBenedictis, Staff Technologist

TITLE: Product Safety & Compliance

COMPANY: Shell Oil Company

SIGNATURE: A DeBenedictis

DATE: August, 1977

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

VENDOR ASSUMES NO RESPONSIBILITY FOR INJURY TO VENDEE OR THIRD PERSONS PROXIMATELY CAUSED BY THE MATERIAL IF REASONABLE SAFETY PROCEDURES ARE NOT ADHERED TO AS STIPULATED IN THE DATA SHEET. ADDITIONALLY, VENDOR ASSUMES NO RESPONSIBILITY FOR INJURY TO VENDEE OR THIRD PERSONS PROXIMATELY CAUSED BY ABNORMAL USE OF THE MATERIAL EVEN IF REASONABLE SAFETY PROCEDURES ARE FOLLOWED. FURTHERMORE, VENDEE ASSUMES THE RISK IN HIS USE OF THE MATERIAL.

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

4/27/84 — SECTION I — CAS #8061-52-7

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
Georgia-Pacific Corporation	(206) 733-4410

ADDRESS (Number, Street, City, State, and ZIP Code)
300 W. Laurel Street, P.O. Box 1236, Bellingham, WA 98225

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Calcium Lignosulfonate	Spent Sulfite Liquor for MONSANTO INDUSTRIAL CHEMICAL COMPANY

CHEMICAL FAMILY	FORMULA
Lignin	---

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
None present		

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	∿218°C	SPECIFIC GRAVITY (H_2O=1)	∿1.14
VAPOR PRESSURE (mm Hg.)	--	PERCENT, VOLATILE BY VOLUME (%)	∿75%
VAPOR DENSITY (AIR=1)	--	EVAPORATION RATE (_____ =1)	--
SOLUBILITY IN WATER	Soluble	pH of 1% solution	∿5-6
APPEARANCE AND ODOR	Dark brown water solution with slight odor.		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
None			

EXTINGUISHING MEDIA

SPECIAL FIRE FIGHTING PROCEDURES
None for solution

UNUSUAL FIRE AND EXPLOSION HAZARDS
None

PAGE (1) (Continued on reverse side) Form OSHA-20 Rev. May 72

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	None known.
EFFECTS OF OVEREXPOSURE	Single dose peroral LD_{50} is 28.5 gms solids/kg in rats. LC_{50} (96 hours, juvenile rainbow trout): ~9,200 mg/l
EMERGENCY AND FIRST AID PROCEDURES	Normal care. Product has extremely low order of acute peroral toxicity in rats and 40% solution by standard tests is non-irritating to the skin or to the eyes of rabbits.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATABILITY *(Materials to avoid)*	Caution necessary with strong oxidizing agetns.		
HAZARDOUS DECOMPOSITION PRODUCTS	SO_2		
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	No hazardous polymerization known.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

No unusual plant procedures - wash with water.

WASTE DISPOSAL METHOD

Customary procedures for industrial waste treatment.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*	Hot vapors of solution -- SO_2 mask recommended.		
VENTILATION	LOCAL EXHAUST		SPECIAL
	MECHANICAL *(General)*	Recommended	OTHER
PROTECTIVE GLOVES	Rubber recommended	EYE PROTECTION	Goggles recommended
OTHER PROTECTIVE EQUIPMENT	As appropriate to prevent contact with body.		

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

None known - use normal care.

OTHER PRECAUTIONS

None known - use normal care.

FORM 1-851

Product Health & Safety Data Sheet

penreco A PENNZOIL DIVISION

4449

I Product Identification

Manufacturer's Name	PENRECO		
Address	106 South Main St., Butler, Pennsylvania 16001		
Regular Telephone No.	412/756-0110	Emergency Telephone No.	412/756-0110
Trade Name	PENETECK		
Synonyms	Mineral Oil Technical		

II Hazardous Ingredients

Material or Component in Hazardous Concentrations	%	Hazard Data
None		

III Health Effect Information

Eye Contact	Negligible effect.
Skin Contact	No effect. Will soften calloused skin.
Inhalation	Inhalation in a mist form at levels above the PEL may cause a change in respiratory performance.
Ingestion	Negligible effect. May act as a laxative.
Health Data	OSHA permissible exposure limit (PEL) for oil mist is 5 mg/M³.
Systemic Effects	No laboratory data is available on this material

See Disclaimer of Warranty on Page 4.

(Approved by U.S. Department of Labor, "Essentially similar to Form OSHA 20, Material Safety Data Sheet")

IV Emergency & First Aid Procedures

Eye Contact	Flush eyes with large amounts of water. Continue at least for 15 minutes. SEEK MEDICAL ATTENTION. If hot liquid is splashed into eyes, treat for burns.
Skin Contact	Remove all contaminated clothing. Wash exposed portions of the skin with soap and water. Contaminated clothing must be washed before being reworn.
Inhalation	Remove exposed person to fresh air immediately. If breathing has stopped, apply artificial respiration and administer oxygen if necessary. SEEK MEDICAL ATTENTION.
Ingestion	If material has been swallowed, DO NOT induce vomiting. SEEK MEDICAL ATTENTION.

V Personal Health Protection Information

Eye Protection	Plastic face shield or splash proof safety goggles should be worn if material is handled in such a way that it could be splashed into eyes.
Skin Protection	Synthetic rubber protective clothing; boots, gloves, aprons, etc. may be worn over parts of body subject to exposure.
Respiratory Protection	Low concentration mist: Use half-mask or full face piece respirator with replaceable cartridge filter. High concentration mist: Use full face supplied air respirator in positive pressure mode or full face self-contained breathing apparatus with positive pressure. NOTE All respirators must be of the NIOSH approved type. DO NOT use compressed oxygen in hydrocarbon atmospheres.
Ventilation	Adequate ventilation in accordance with good engineering practice must be provided to keep any oil mist concentration below the PEL.
Other	Wash hands and face with soap and water before smoking or eating.

VI Fire Protection Information

Flash Point (Test Method)	Approx. 265°F C.O.C.		**Autoignition Temperature (°F)**	> 600°F
Flammable Limits In Air % By Vol.	**Lower**	Unknown	**Upper**	Unknown
Extinguishing Media	Foam, dry chemical, carbon dioxide			
Special Fire Fighting Procedures	Treat as oil fire. Use water only to cool surrounding containers of flammable or combustible material.			
Unusual Fire and Explosive Conditions	Dense smoke may be generated when burning.			
Hazardous Combustion Products	Products of combustion — smoke, CO, CO_2.			

VII Reactivity Data

Stability (thermal, light, etc.)	**Stable**	X	**Conditions to Avoid**	None
	Unstable			
Incompatibility (materials to avoid)	Strong oxidizing agents			
Hazardous Decomposition Products	None			
Hazardous Polymerization	**Stable**	X	**Conditions to Avoid**	None
	Unstable			

VIII Environmental Precautions

Steps To Be Taken if Material is Released or Spilled	Scrape up material into waste containers, or absorb with dry sand or oil absorbents. Clean spill area with detergent solutions or safety solvents. Provide adequate ventilation during clean up.
Waste Disposal Method	Waste materials should be dumped or buried in an approved industrial waste land fill. Large quantities may be disposed of by incineration in a suitable combustion chamber. Disposal must comply with all federal, state, and local regulations.

IX Special Precautions

Handling and Storage Requirements	Store in sealed containers away from heat, open flame, and oxidizing materials. Fire extinguishers must be kept readily available and personnel trained in proper use. See NFPA 30 and OSHA 1910.106 — FLAMMABLE AND COMBUSTIBLE LIQUIDS.
Precautionary Statements	Do not transfer to unmarked containers. Follow DOT regulations during transport. Proprietary chemicals obtained from various manufacturers are added to this product. This sheet contains information, if any, received from manufacturers of such additives regarding any hazardous ingredients contained therein, relevant health effects, emergency first aid procedures, etc. Should additional information be required, contact Pennzoil Company.

X Physical Properties

Boiling Point (°F)	Approx. 510°F	**Melting Point (°F)**	NA	**Solubility** Soluble in hydrocarbons.
Vapor Pressure (mm Hg & temp.)	1 mm Hg @ 70°F	**Specific Gravity (H_2O = 1)**	Approx. 0.80 @ 60°F/60°F	**Appearance, Color, Odor, etc.** Transparent, white liquid Odorless
Molecular Weight	varies	**Percent Volatile by Volume (%)**	nil @ ambient temp.	**Other**
Vapor Density (air = 1)	<1	**Evaporation Rate (EE = 1)**	<1	

Approved By: George Brothers, Mgr., Tech. Services

Date April, 1977
Revised: February, 1981
Revised: March, 1983

The above information is based on data available to us and is believed to be correct. However, NO WARRANTY of MERCHANTABILITY, FITNESS for any use or any other warranty is expressed or to be implied regarding the accuracy of these data, the results to be obtained from the use thereof, the hazards connected with the use of the material, or that any such use will not infringe any patent. Since the information contained herein may be applied under conditions beyond our control and with which we may be unfamiliar, we do not assume any responsibility for the results of its use. This information is furnished upon the condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917).

PRODUCT SAFETY
DATA SHEET

OLYMPIC CHEMICAL CORPORATION

GENERAL INFORMATION

Trade Name (Common Name or Synonym)	Chemical Name
Sodium Bisulfite Solution, Food Grade	Sodium Bisulfite, aqueous solution
Formula	**Molecular Weight**
38% $NaHSO_3$ in water	104.06

Company/Plant Address

Olympic Chemical Corporation
Office: 702 A St.
Tacoma, WA 98402
206/572-2535

Plant: 1002 East D St.
Tacoma, WA
206/572-4215

B. FIRST AID MEASURES

Skin: Wash with plenty of water.

Eyes: Flush with plenty of water for at least 15 minutes and get medical attention.

Ingestion: Drink water—then induce vomiting and get medical attention.

Get medical attention for irritation or discomfort from inhalation.

HAZARDS INFORMATION

FIRE AND EXPLOSION

Flash Point	Auto Ignition Temp.	Flammable Limits in Air (% by vol.)
Not Flammable	NA—Not Applicable	Lower—NA Upper—NA

Unusual Fire and Explosion Hazards
Evolves sulfur dioxide gas when open to the atmosphere. Sulfur dioxide gas will be released at a rate increasing with temperature.

HEALTH

Inhalation
Inhalation of product mist may irritate nose, throat and lungs.

Ingestion
May irritate mouth, esophagus, stomach, etc.

Skin
May cause skin irritation from prolonged contact.

Eyes
May irritate or burn eyes.

Permissible Concentration: (See Section I)
Air
Threshold Limit Value (TLV)
No value located. TLV for SO_2 is 5 ppm.

Unusual Chronic Toxicity
May cause allergic symptoms in certain individuals.

D. PRECAUTIONS/PROCEDURES

Ventilation Sufficient to eliminate mists and SO_2 and reduce concentration to below current permissible TLV levels. Packaging and unloading areas and open processing equipment should be equipped with mechanical exhaust systems.
Normal Handling Avoid exposure to sulfurous gases released by the solution.
Storage Store in closed containers and in a cool, well-ventilated area away from acids and oxidizing agents.
Spill or Leak Dilute small spills or leaks cautiously with plenty of water. Neutralize residue with alkali such as soda ash, lime or limestone. Adequate ventilation is required due to release of SO_2 gas and when using soda ash or limestone due to release of CO_2 gas. (See Section H for disposal methods.)
Special Fire Fighting Precautions Because sulfur dioxide gas may be present, wearing a NIOSH-approved, self-contained respirator may be required.

E. PERSONAL PROTECTIVE EQUIPMENT

Respiratory Protection Where required, use a respirator approved by NIOSH for SO_2 gases or mists, as applicable. Some exposures may require NIOSH-approved, self-contained breathing apparatus or air supplied respirator.
Eyes and Face As a minimum, wear hard hat and chemical safety goggles. Do not wear contact lenses.
Hands, Arms, and Body As a minimum, wear acid-resistant apron, long-sleeve shirt and trousers, and resistant gloves for routine product use.

F. PHYSICAL DATA

Material Is (At Normal Conditions) ☒ Liquid ☐ Solid ☐ Gas	Appearance and Odor Yellow liquid. Pungent sulfur dioxide gas odor.
Specific Gravity ($H_2O = 1$) 1.37	Solubility in Water (% by weight) Complete
pH 1% solution; pH = 4.1	Vapor Pressure (mm Hg at 20° C) 32 (est.) at 25° C)

Hooker Industrial chemicals DIVISION

ADAPTED FROM USDL FORM NO. LSB - 005-4

MATERIAL SAFETY DATA SHEET

NFPA Designation

CHEMICAL NAME:	PLANT CODE	MATERIAL CODE NO.
Sodium Sulfhydrate, Liquid (NaSH, 45%)		

MANUFACTURER'S NAME: Hooker Chemical Corporation
EMERGENCY TELEPHONE NO.: (716) - 285-6655

ADDRESS: (NUMBER, STREET, CITY, STATE AND ZIP CODE): 4700 Buffalo Avenue, Niagara Falls, New York 14302

CHEMICAL NAME AND SYNONYMS: Sodium Hydrosulfide
TRADE NAME: NaSH, 45% Sodium Sulfhydrate, Liquid

CHEMICAL FORMULA	MOL. WT.	USES
NaSH (+55±1% H_2O)	56.07	Leather production; chemical intermediate in preparation of mercaptans, dyes, pharmaceuticals, etc.

Physical Properties

BOILING POINT (°F) (Initial)	250	SPECIFIC GRAVITY (H_2O =1)	1.3
VAPOR PRESSURE (mmHg)	--	PERCENT VOLATILE BY VOLUME (%)	70%
VAPOR DENSITY (AIR=1)	--	EVAPORATION RATE (=1)	--
SOLUBILITY IN WATER	Infinite	Freezing Range (°F)	57-61

APPEARANCE AND ODOR: Reddish brown liquid with characteristic sulfide odor.

Fire and Explosion Hazard Data

FLASH POINT	METHOD	FLAMMABLE LIMITS		AUTOIGNITION TEMP.
None °F		UEL --	LEL --	°F

EXTINGUISHING MEDIA: Not combustible.

SPECIAL FIRE FIGHTING PROCEDURES: As appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Can form pyrophoric iron sulfide in contact with iron equipment. Upon drying out, this iron sulfide spontaneously oxidizes; the heat of reaction can raise the temperature to a red heat, providing a source of ignition.

Reactivity

INCOMPATIBILITY: Reacts with acids to form toxic, flammable hydrogen sulfide gas. Can react vigorously with diazonium compounds and with oxidizing materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Can form toxic, corrosive products including caustic soda, hydrogen sulfide gas, sulfur dioxide gas, etc.

CONDITIONS TO AVOID: Avoid uncontrolled contact with acids or oxidizing materials. Do not flush to sewers which may contain acids. Avoid contact with skin or eyes.

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02-003
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03-008
03-017

Health Related Data

THRESHOLD LIMIT VALUE Not specified.

EFFECTS OF OVEREXPOSURE (SKIN, EYE, INHALATION, ETC.) Highly alkaline nature can cause severe burns of skin and eyes. Strong solutions can remove hair. Ingestion irritates mucous membranes of gastro-intestinal tract; reaction with stomach acid liberates hydrogen sulfide. Mist irritating to mucous membranes, especially the upper respiratory tract.

EMERGENCY AND FIRST AID PROCEDURES EYES: Flush eyes and lids thoroughly with water. SKIN: Flush with large amount of water. MIST INHALATION: Flush mouth repeatedly with cold water. INGESTION: Dilute by drinking large quantities of milk or water. Do not induce vomiting; if vomiting occurs, administer more water.

SPECIAL MEDICAL PROCEDURES Get medical assistance for ALL eye exposures and any serious over-exposures. In case of ingestion, after dilution, administer fruit juice or diluted vinegar to accomplish neutralization. Do not apply or administer oils or ointments unless ordered by the physician.

Special Protection Information

VENTILATION General room ventilation plus local exhaust at points of potential fume emission.

RESPIRATORY (TYPE) Mist protection where applicable.

GLOVES (TYPE) Rubber, neoprene or vinyl.

EYE (TYPE) Chemical safety goggles, plus face shield where appropriate.

OTHER Rubber safety shoes or boots, hard hats with brim, rubber or neoprene suits or aprons for splash protection.

SPECIAL PRECAUTIONS FOR HANDLING AND STORAGE Storage tanks should be diked. Area drainage should be kept separate from acid-containing sewers. Idle iron equipment should be trap-sealed or padded with inert gas to exclude air.

STEPS TO TAKE IN EVENT OF SPILL OR RELEASE Get protective equipment. Contain spill and pump into drums. Finally flush spill area with water, routing drainage to non-acid sewer or to disposal unit. If spill enters sewer system, notify sewer authority and add dilution water.

WASTE DISPOSAL Transfer to treating equipment and oxidize material to sulfate and thiosulfate before discharging to sewer.

REMARKS Hydrogen sulfide gas is primary hazard encountered in most emergencies; full face acid-gas canister masks or self-contained breathing apparatus indicated.

REFERENCES Hooker Chemical Corporation Product Data Sheet No. 770-A: Sodium Sulfhydrate, Liquid.

NAME G. W. Darling

LOC. Niagara-ICD

DATE April 1972

MATERIAL SAFETY DATA SHEET

PENNWALT CORPORATION

"ESSENTIALLY SIMILAR" TO OSHA FORM 20

FORM 4040 (Rev. 9-80)

ADDRESS: Pennwalt Corporation
500 N.E. Multnomah St.
Suite 880
Portland, OR 97232

PRODUCT IDENTIFICATION

Pennwalt Product Name: Caustic Soda, 50% Standard Grade (Aqueous)

Pennwalt Code No.: 0209

Chemical Name and Molecular Formula: Sodium Hydroxide NaOH

Emergency Phone Number(s): Hrs. Business: 503-238-7230 Other: 503-228-7655 206-627-9101

CAS No.(s): 1310-73-2

Synonyms: Caustic Soda, Liquid Caustic Soda

Chemical Family: Alkali

HAZARDOUS INGREDIENTS

MATERIALS OR COMPONENTS	% w/w	HAZARD DATA (TLV, LD50, LC50, etc.)
Sodium Hydroxide	50	orl-rbt: LDLo: 500 mg/kg Corrosive Liquid See Toxicity Section

SHIPPING INFORMATION

T/T: RQ Caustic Soda, Solution; Corrosive Material; UN 1824 Corrosive Placards.

T/C: RQ Caustic Soda, Solution; Corrosive Materia; UN 1824 Placarded Corrosive; STCC 4935240

PHYSICAL PROPERTIES

Boiling Point/Range	Melting Point	Freezing Point	Molecular Weight (Calculated)
142 °C 288 °F	- °C - °F	12 °C 54 °F	40.01

Specific Gravity (H_2O=1)	Vapor Pressure (mm Hg)	Vapor Density (Air=1)
1.525 @ / 20 °C	1.6 @ 20 °C 68 °F	

Solubility in H_2O	% Volatiles by Volume	Evaporation Rate	Other
100%	Non-Volatile	☐ Ether = 1 ☐ Water = 1 ☐ Butylacetate = 1	

Appearance and Odor: Water white, clear to slightly trubid liquid.

FIRE AND EXPLOSION DATA

Flash Point: None °C °F Test Method: Non-combustible

Flammable Limits: Lower % Upper None %

Autoignition Temperature/Fire Point: °C None °F

EXTINGUISHING MEDIA

☐ Water-spray ☐ Water-fog ☐ Water stream ☐ CO_2 ☐ Dry chemical ☐ Alcohol foam ☐ Foam ☐ Earth or sand

SPECIAL FIRE FIGHTING PROCEDURES

☐ Do not enter building ☐ Allow fire to burn ☐ Water may cause frothing ☐ Do not use water

UNUSUAL FIRE AND EXPLOSION HAZARDS

☐ Dust explosion hazard ☐ Sensitive to shock ☐ Contamination ☐ Temperature ☐ Other (specify):

REACTIVITY DATA

STABILITY

☒ Stable ☐ Unstable

CONDITIONS CONTRIBUTING TO INSTABILITY

☐ Thermal decomposition ☐ Photo degradation ☐ Polymerization ☐ Contamination

INCOMPATIBILITY - Avoid contact with

☒ Strong acids ☐ Strong alkalis ☒ Other: Can react violently or explosively with some chemicals such as chlorinated hydrocarbons and organic acids. Hazardous carbon monixide gas can form upon contact with food and beverage products in enclosed spaces and can cause death. Follow appropriate tank entry procedures (See ANSI Z117.1-1977).

HAZARDOUS DECOMPOSITION PRODUCTS - THERMAL AND OTHER (list)

CONDITIONS TO AVOID

☐ Heat ☐ Open flames ☐ Sparks ☐ Ignition sources ☐ Other (specify):

SPILL OR LEAK

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

☒ Flush with water ☐ Absorb with sand or inert material ☒ Neutralize ☐ Sweep or scoop up and remove ☐ Keep upwind. Evacuate enclosed spaces. ☐ Prevent spread or spill

☐ Dispose of immediately ☐ Other (specify):

WASTE DISPOSAL METHOD - *Consult federal, state, or local authorities for proper disposal procedures.*

Dilute with water then neutralize with acid.

CONTINUED ON REVERSE SIDE

NA – Not Applicable.

9/25/81

TOXICITY

Oral (acute): Causes severe burns of the mucous membranes of the mouth, throat, esophagus and stomach.

Dermal (acute): Corrosive burns to all body tissue in contact.

Eye: Causes very rapid severe damage.

Inhalation (acute): May vary from mild irritation of nasal mucous membranes to severe pneumonitis.

Chronic, Subchronic, etc.: May consist of multiple areas of superficial destruction of the skin or of primary irritant dermatitis, similarily, inhalation of the mist may result in varying degress of irritation of the respiratory tract tissues.

HEALTH HAZARD INFORMATION

Effects of Exposure

PERMISSIBLE EXPOSURE LIMIT (Specify if TLV/TWA or Ceiling [c])

ACGIH 1981 TLV 2mg/m3 (air)

OSHA 1981 TWA 2mg/m3 (air)

Other: These are ceiling limits.

IRRITATION	☐ Skin	☐ Severe	☐ Moderate	
	☐ Eye	☐ Severe	☐ Moderate	☐ Mild (transient)
CORROSIVITY	☒ Skin	☐ 4 hrs. (DOT)	☐ 24 hrs. (CPSC)	
	☒ Eye	☒ May cause blindness		

SENSITIZATION: ☐ Skin ☐ Respiratory ☐ Allergen

INHALATION EFFECTS: ☐ Narcotic effect ☐ Cyanosis ☐ Asphyxiant

LUNG EFFECTS (Specify): Inhalation of mist may cause damage to upper respiratory tract and even to lung tissue proper.

OTHER (Specify): ☐ Repeated contact - skin defatter ☐ Other (Specify):

Emergency First Aid

INGESTION	☐ Induce vomiting	☒ Do NOT induce vomiting	☒ Give plenty of water	☒ Get medical attention	☒ Other (specify): Drink large quantities of milk, follow with dilute vinegar or fruit juice.
DERMAL	☒ Flush with soap and water	☒ Get medical attention	☐ Contaminated clothing - remove & launder	☐ Contaminated shoes - destroy	☐ Other (specify):
EYE CONTACT	☒ Flush with plenty of water for at least 15 minutes		☒ Get medical attention	☐ Other (specify):	
INHALATION	☒ Remove to fresh air	☐ If not breathing, give artificial respiration	☐ Give oxygen	☒ Get medical attention	☐ Other (specify):

SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS — *Always maintain exposure below permissible exposure limits*

☐ Consult an industrial hygienist or environmental health specialist ☐ Local exhaust ☒ Use with adequate ventilation ☐ Check for air contaminant and oxygen deficiency

☐ Other (specify): For proper tank entry procedures, see ANSI Z117.1-1977. Monitor carbon monoxide and oxygen levels in tanks and enclosed spaces.

EYE	☒ Face shield	HAND (GLOVE TYPE)	☒ Butyl rubber	☐ Polyvinyl alcohol	☐ Other (specify):	
☐ Safety glasses	☒ Goggles	☒ Polyvinyl chloride	☒ Neoprene	☒ Natural rubber	☐ Poly-ethylene	

RESPIRATOR TYPE - *Use only NIOSH / MESA approved equipment*

☐ Self-contained ☐ Supplied air ☐ Can or cartridge gas or vapor ☒ Filter - dust, fume, (mist) ☐ Other (specify):

OTHER PROTECTIVE EQUIPMENT

☐ Rubber boots ☐ Apron ☒ Other (specify): Rubber boots, cotton work clothes, rubber suit or apron, if necessary.

SPECIAL PRECAUTIONS

PRECAUTIONARY LABELING

☒ Wash thoroughly after handling	☒ Do not get in eyes, on skin or clothing	☒ Do not breathe dust, vapor (mist) gas	☒ Keep container closed	☐ Keep away from heat, sparks, and open flames	☒ Store in tightly closed containers
☐ Do not store near combustibles	☐ Keep from contact with clothing and other combustible materials	☒ Empty container may contain hazardous residues	☐ Use explosion proof equipment	☐ Other (specify):	

Other handling and storage conditions: Safety showers and eye wash fountains should be installed in any area where NaOH is handled.

Prepared by	Date	Address	Phone
James E. Fike	9/25/81	3 Parkway, Phila., PA 19102	215-587-7[illegible]

PLEASE NOTE ▶ "The above information is accurate to the best of our knowledge. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use, or misuse are beyond our control, Pennwalt MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THE INFORMATION CONTAINED HEREIN AND DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON. User should satisfy himself that he has all current data relevant to his particular use.

CONDITIONS CONTRIBUTING TO INSTABILITY

Reacts violently when water added to Sulfuric Acid

INCOMPATIBILITY

Extremely hazardous in contact with many materials, particularly carbides, chlorates, fulminates, nitrates, picrates, powdered metals and other combustible materials.

HAZARDOUS DECOMPOSITION PRODUCTS

Attacks many metals, releasing hydrogen

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

VII DISPOSAL, SPILL OR LEAK PROCEDURES

AQUATIC TOXICITY (E.G. 96 HR. TLM):

WASTE DISPOSAL METHOD

A hazardous waste. Dispose of in accordance with the instructions of State and Federal hazardous waste authorities.

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Do not breathe vapor. Wear full protective clothing including self-contained breathing apparatus. Contain and neutralize. Do not allow to enter waterways.

NEUTRALIZING CHEMICALS

Caustic Soda (Sodium Hydroxide)
Soda Ash (Sodium Carbonate)

VIII SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS

Enclosure and exhaust ventilation

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT For non-emergency use, acid gas canister where atmosphere is greater than 19.5% oxygen.

RESPIRATORY (SPECIFY IN DETAIL) All other atmospheres, self-containted breathing apparatus.

EYE

Chemical resistant goggles

GLOVES

Chemical resistant gloves

OTHER CLOTHING AND EQUIPMENT

Acid resistant suit or acid resistant pants and jacket. rubber boots.

IX SPECIAL PRECAUTIONS

PRECAUTIONARY STATEMENTS

Individuals with pre-existing asthma or other respiratory or cardiac disease should be excluded from work with this material, since excessive exposures may result in bronchial constriction (American Industrial Hygiene Association)

OTHER HANDLING AND STORAGE REQUIREMENTS

ADDITIONAL REGULATORY CONCERNS

FEDERAL:

FDA

USDA

CPSC

TSCA IS THIS PRODUCT, OR ALL ITS INGREDIENTS; BEING CERTIFIED FOR INCLUSION ON THE TOXIC SUBSTANCES CONTROL A INVENTORY OF CHEMICAL SUBSTANCES? Yes

OTHER

STATE:

Allied Chemical
An ALLIED Company

PRODUCT SAFETY DATA SHEET

SULFURIC ACID

A. GENERAL INFORMATION

TRADE NAME (COMMON NAME OR SYNONYM)	☒ C.A.S. NO. ☐ ALLIED PRODUCT CODE #
SULFURIC ACID	7664-93-9

CHEMICAL NAME: Sulfuric Acid

FORMULA	MOLECULAR WEIGHT
77 to 99 wt. % H_2SO_4 in water	98.08

ADDRESS (No., STREET, CITY, STATE AND ZIP CODE)

ALLIED CHEMICAL
P.O. Box 1139R
Morristown, N.J. 07960

CONTACT	PHONE NUMBER	ISSUED DATE	REVISED DATE
Director, Product Safety	(201) 455-4157	June, 1980	July, 1982

B. FIRST AID MEASURES

EMERGENCY PHONE NUMBER: (201) 455-2000

Skin or Eyes: Immediately flush with plenty of water continuing for at least 15 minutes. Remove contaminated clothing. Continue flushing with water if medical attention is not immediately available.
Ingestion: Drink large amounts of water (or milk if available) to dilute the acid. Do not induce vomiting.
Inhalation: Remove to fresh air. Observe for possible delayed reaction. If breathing has stopped, give artificial respiration. If breathing with difficulty, give oxygen, provided a qualified operator is available.

GET PROMPT MEDICAL ATTENTION for ingestion, inhalation, eye contact, irritation, or burns. Additional procedures are outlined in References listed in Section J.

C. HAZARDS INFORMATION

HEALTH

INHALATION
Inhalation of fumes or acid mist can cause irritation or corrosive burns to the upper respiratory system, including nose, mouth, and throat. Lung irritation and pulmonary edema can also occur. LC_{50} (mist, animals): 20-60 mg/cu.m. —Ref. (a).

INGESTION
Can cause irritation and corrosive burns to mouth, throat, and stomach. Can be fatal if swallowed.
Applicable to dilute solutions: LD_{50} (rat): 2140 mg/kg —Reference (b).

SKIN
Can cause severe burns or irritation.

EYES
Liquid contact can cause irritation, corneal burns, and conjunctivitis. Blindness may result, or severe or permanent injury. Mist contact may irritate or burn. Reference (b).

PERMISSIBLE CONCENTRATION AIR (SEE SECTION J): 1 mg/cu.m. (as H_2SO_4) (OSHA)
BIOLOGICAL

TLV: same (ACGIH)

UNUSUAL CHRONIC TOXICITY
(1) Erosion of teeth, (2) lesions of the skin, (3) tracheo-bronchitis, (4) mouth inflammation, (5) conjunctivitis, (6) gastritis. —Reference (a).

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C. HAZARDS (Cont.)

FIRE AND EXPLOSION

FLASH POINT °C	AUTO IGNITION TEMPERATURE °C	FLAMMABLE LIMITS IN AIR (% BY VOL.)
Not Flammable ☐ OPEN CUP ☐ CLOSED CUP	Not applicable	Not applicable

UNUSUAL FIRE AND EXPLOSION HAZARDS

Flammable and potentially explosive hydrogen gas can be generated inside metal drums and storage tanks. Concentrated acid (as sold) can ignite combustible materials on contact.

D. PRECAUTIONS/PROCEDURES

FIRE EXTINGUISHING AGENTS RECOMMENDED

Use water spray or other suitable agent for fires adjacent to non-leaking tanks or other containers of sulfuric acid.

FIRE EXTINGUISHING AGENTS TO AVOID

Do not use solid water streams near ruptured tanks or spills of sulfuric acid. Acid reacts violently with water and can spatter acid onto personnel.

SPECIAL FIRE FIGHTING PRECAUTIONS

At high temperatures, sulfuric acid mist or sulfur trioxide gas can be released from vented or ruptured containers. If water is added to concentrated sulfuric acid, violent spattering can occur, and considerable heat may be evolved. Wear NIOSH-approved self-contained breathing apparatus with full facepiece and full protective clothing. Cool non-leaking fire-exposed containers with water spray.

VENTILATION

Sufficient to reduce vapor and acid mists to permissible levels. Packaging and unloading areas and open processing equipment may require mechanical exhaust systems. Corrosion-proof construction recommended.

NORMAL HANDLING

Keep sources of ignition away. Do not get in eyes, on skin, on clothing. Do not breathe vapor or mist. Use with adequate ventilation and use protective equipment as outlined in Section E. Procedures are detailed in references listed in Section J (Allied). Do not add water to acid. When diluting, always add acid to water, using caution and proper agitation.

STORAGE

Store in cool, well-ventilated area away from combustibles and reactive chemicals. Vent metal containers weekly or more frequently in hot weather to prevent hydrogen gas build-up. Diking of storage tanks is recommended.

SPILL OR LEAK

Dilute small spills or leaks cautiously with plenty of water. Neutralize residue with alkali such as soda ash or lime. Adequate ventilation is required for soda ash due to release of carbon dioxide gas. No smoking in spill area. For major spills, keep unprotected persons away. Protected persons should contain the acid by diking the spill with soil or clay. Recover the acid if possible. (See Section I for disposal methods.) Attempt to keep out of sewer. Any release to the environment of these products may be subject to Federal and/or state reporting requirements. Check with appropriate agencies.

SPECIAL: PRECAUTIONS/PROCEDURES/LABEL INSTRUCTIONS

Vapor may contain explosive hydrogen. To prevent ignition of this if present, smoking, flames, and sparks should not be permitted in storage areas. Causes severe burns. Label signal word: DANGER!

E. PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION

Where required, use a respirator approved by NIOSH for sulfuric acid or mists, as applicable. Some exposures may require a self-contained breathing apparatus with full facepiece or supplied-air respirator with a full facepiece, helmet, or hood. —References (e, f, g).

EYES AND FACE

As a minimum, wear hard hat, chemical safety goggles, and full-face plastic shield. Do not wear contact lenses. For increased protection, use supplied-air acid hood.

HANDS, ARMS, AND BODY

As a minimum, wear acid-resistant apron, protective clothing, boots and gauntlet gloves for routine product use. For increased protection, include acid-resistant trousers and jacket.

OTHER CLOTHING AND EQUIPMENT

Eyewash and quick-drench shower facilities, protected from freezing, should be available wherever Sulfuric Acid is stored or handled.

F. PHYSICAL DATA

MATERIAL IS (AT NORMAL CONDITIONS):	APPEARANCE AND ODOR	
☒ LIQUID ☐ SOLID ☐ GAS ☐ _____	Oily, colorless to slightly yellow, clear to turbid liquid. Odorless.	
BOILING POINT *a. 193 °C b. 279 MELTING POINT c. 310 °C	SPECIFIC GRAVITY (H_2O = 1) *a. 1.706 b. 1.835 c. 1.842	VAPOR DENSITY (AIR = 1) Not applicable
SOLUBILITY IN WATER (% by Weight) Complete	pH 1% solution: pH = 0.9	VAPOR PRESSURE (mm Hg at 20° C) ☐ (PSIG) ☐ negligible @ ambient
EVAPORATION RATE (Butyl Acetate = 1) ☐ (Ether = 1) ☐ Not applicable	% VOLATILES BY VOLUME (At 20° C) Not applicable	*a. 60°Be= 77.7% H_2SO_4 b. 66°Be=93% H_2SO_4 c. 99% H_2SO_4

G. REACTIVITY DATA

STABILITY	CONDITIONS TO AVOID
☐ UNSTABLE ☒ STABLE	Temperatures of 300°C or higher: yields sulfur trioxide gas, which is toxic, corrosive, and an oxidizer.

INCOMPATIBILITY (MATERIALS TO AVOID)

Nitro compounds, carbides, dienes, alcohols (when heated): cause explosions-Refs. (i, j, k). Oxidizing agents, such as chlorates and permanganates: cause fires and possibly explosions. Allyl compounds and aldehydes: undergo polymerization, possibly violent—Ref. (i), (continued, Section K).

HAZARDOUS DECOMPOSITION PRODUCTS

Sulfur trioxide gas: see above. Also this is a fire risk if in contact with organic materials.

HAZARDOUS POLYMERIZATION	CONDITIONS TO AVOID
☐ MAY OCCUR ☒ WILL NOT OCCUR	

H. HAZARDOUS INGREDIENTS (Mixtures Only)

MATERIAL OR COMPONENT/C.A.S. #	WT. %	HAZARD DATA (SEE SECT. J)
NOT APPLICABLE		

I. ENVIRONMENTAL

DEGRADABILITY/AQUATIC TOXICITY	OCTANOL/WATER PARTITION COEFFICIENT
Aquatic Toxicity: 24.5 ppm/24 hr./bluegill/lethal/fresh water 42.5 ppm/48 hr./prawn/LC_{50}/salt water	

EPA HAZARDOUS SUBSTANCE? ☒ YES ☐ NO	IF SO, REPORTABLE QUANTITY: 1000 # (100% H_2SO_4 basis)	40 CFR 116-117

WASTE DISPOSAL METHODS (DISPOSER MUST COMPLY WITH FEDERAL, STATE AND LOCAL DISPOSAL OR DISCHARGE LAWS)

Waste sulfuric acid should be cautiously diluted with water and neutralized with an alkali. Neutralized waste must be disposed of in accordance with applicable disposal regulations. Waste may have to be disposed of by an approved contractor. (EPA corrosive waste—D002) applicable to the unneutralized acid).

RCRA STATUS OF UNUSED MATERIAL:	40 CFR 261.22
EPA Hazardous Waste No. D002 (corrosive) if discarded	

J. REFERENCES

PERMISSIBLE CONCENTRATION REFERENCES

(1) OSHA standard at 29 CFR 1910.1000 (1981).
(2) TLV from the ACGIH 1981 list, "Threshold Limit Values for Chemical Substances. . .", Am. Conf. of Governmental Industrial Hygienists, Cincinnati 45202.

REGULATORY STANDARDS	D.O.T. CLASSIFICATION: Corrosive material	49 CFR
	DOT ID Number: UN 1830.	

GENERAL
(a) Documentation of the Threshold Limit Values, 4th Edition, 1981, Am. Conf. of Governmental Hygienists, Cincinnati 45202.
(b) NIOSH, Registry of Toxic Effects of Chemical Substances, 1979, Accession #WS 556 00 000, PB81-154478, Nat. Tech. Info. Service, Springfield, VA 22161.
(c) Allied Corporation wall chart.
(d) Allied Corporation product information bulletin.

K. ADDITIONAL INFORMATION

J. REFERENCES—General (continued)

(e) "Criteria for a Recommended Standard. . . Occupational Exposure to Sulfuric Acid", NIOSH U.S. Dept. of HHS, 1974, PB233098, Nat. Tech. Info. Service, Springfield, VA 22161.
(f) NIOSH/OSHA, "Pocket Guide to Chemical Hazards. . .", 1978.
(g) "NIOSH/OSHA—Occupational Health Guidelines for Chemical Hazards—Sulfuric Acid", 1978.
(h) Allied Chemical Technical Service Report for storage and handling procedures.
(i) NFPA Manual 491M, "Manual of Hazardous Chemical Reactions, 1975, Nat. Fire Protection Assoc., Boston 02210.
(j) Allied Corporation Product Safety Data Sheet for Sodium Sulfite, 1982.
(k) Bretherick, L., Handbook of Reactive Chemical Hazards, 2nd Ed., 1979, Butterworths, Boston.

G. REACTIVITY DATA—Incompatibility (continued)

Alkalis, amines, water, hydrated salts, carboxylic acid anhydrides, nitriles, olefinic organics, glycols, aqueous acids: cause strong exothermic reactions. —Refs. (i, k). Carbonates, cyanides, sulfides, sulfites, metals such as copper: yield toxic gases. —Refs. (j, k). Also for metals, see hydrogen generation, Section C.

Information (hazards, precautions, first aid, etc.) is abbreviated. More detailed information is contained in references found in Section J.

This product is not for food or drug use.

ESSO CHEMICALS

MATERIAL SAFETY DATA SHEET

PRODUCT
TOLUENE

SECTION I – IDENTIFICATION OF PRODUCT

EMERGENCY TELEPHONE NO (416) 924-9849 (HEALTH) 519-339-2145 (OTHER)
TRADE NAME TOLUENE
CHEMICAL NAME AROMATIC PETROLEUM SOLVENT
CHEMICAL FAMILY AROMATIC HYDROCARBON
CHEMICAL FORMULA C7 H8

SECTION II – HAZARDOUS INGREDIENTS

NOT APPLICABLE

SECTION III – PHYSICAL DATA

BOILING RANGE	DEGREES °C (°F)	SPECIFIC GRAVITY (WATER = 1)	0.87
INITIAL BO PT	110 (230)	PERCENT VOLATILE BY VOLUME	100
DRY/FINAL PT	111 (232)	EVAP RATE (N-BUTYL ACETATE = 1)	1.94
VAPOR PRESSURE	64 MM HG AT 38C	SOLUBILITY IN WATER	NEGLIGIBLE
VAPOR DENSITY (AIR = 1)	3.2	APPEARANCE	WATER-WHITE LIQUID

SECTION IV – FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 6C (42F) TAG CL CUP FLAMMABLE LIMITS LEL 1.3PCT UEL 6.7PCT

IMCO HAZARD CLASS – INFLAMMABLE LIQUID/ 3.2
EXTINGUISHING MEDIA – DRY CHEMICAL OR FOAM. FOG NOZZLE APPLIED WATER SPRAY.
SPECIAL FIRE FIGHTING PROCEDURES – USE WATERSPRAY TO COOL FIRE-EXPOSED SURFACES & TO PROTECT PERSONNEL. WHEN USING WATER SPRAY, BOILOVER MAY OCCUR WHEN FINAL BOILING POINT OF SOLVENT APPROACHES THAT OF WATER. USE AIR-SUPPLIED RESCUE EQUIPMENT FOR ENCLOSED AREAS. DO NOT EXTINGUISH FLAME AT LEAK BECAUSE POSSIBILITY OF UNCONTROLLED EXPLOSIVE REIGNITION EXISTS. CUT OFF THE FUEL AND/OR ALLOW THE FIRE TO BURN OUT. EXTINGUISH SMALL RESIDUAL FIRES WITH DRY CHEMICAL POWDER OR WATER SPRAY. TRY TO COVER LIQUID SPILLS WITH FOAM.
UNUSUAL FIRE & EXPLOSION HAZARD – DO NOT STORE OR MIX WITH STRONG OXIDANTS. CO EVOLVED IF COMBUSTION INCOMPLETE. EXTREME HAZARD. LEAKS OF GAS OR SPILLS OF LIQUID CAN READILY FORM FLAMMABLE MIXTURES AT TEMPERATURES AT OR ABOVE FLASH POINT.

ESSO CHEMICAL CANADA, a division of IMPERIAL OIL LIMITED
2300 Yonge St., Toronto, Ontario M5W 1K3 Tel. No. 416-488-6600

(OVER)

SECTION V – HEALTH HAZARD DATA

OCCUPATIONAL EXPOSURE LIMIT (OEL) FOR – TOLUENE .

TLV PER ACGIH IS 100 PPM.

EFFECT OF OVEREXPOSURE – Inhalation of high concentrations can produce central nervous system depression which can, in turn, lead to a loss of coordination, impaired judgement and, if exposure is prolonged, result in stupc and unconsciousness. Prolonged or repeated contact with the skin will dry and defat it, eventually causing irritation and dermatitis.

EMERGENCY AND FIRST AID PROCEDURES – If overcome by vapors, remove to fresh air and if breathing stopped, give artificial respiration. Keep individual calm and call a physician. If accidental skin or eye contact occurs, remove any contaminated clothing and flush area with water until irritation subsides. In case of accidental ingestion, vomiting should not be induced due to the hazard of solvent aspiration and subsequent chemical pneumonitis. Call a physician.

SECTION VI – REACTIVITY DATA

STABILITY Unstable
Stable X

INCOMPATIBILITY (MATERIALS TO AVOID) – Strong oxidants like liquid chlorine and concentrated oxygen.

HAZARDOUS DECOMPOSITION PRODUCTS – Carbon monoxide if combustion incomplete.

SECTION VII – SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED – Remove all ignition sources. Keep people away. Recover free liquid. Add absorbent to spill area. Avoid breathing vapors. Ventilate enclosed spaces. Open all windows and doors. Keep petroleum products out of streams and waterways.

WASTE DISPOSAL METHOD – Remove all ignition sources. Contain spilled liquid with sand or earth. Consult an expert in removal of material. Ensure conformity to local disposal regulations.

SECTION VIII – PERSONAL PROTECTION INFORMATION

RESPIRATORY PROTECTION – Organic vapor canisters or cartridges for use in non-emergency situations above the OEL (TLV) where the hydrocarbon odor provides an adequate warning of end of sorbent life. For emergencies involving very high concentrations of the hydrocarbon use self contained breathing apparatus.

VENTILATION

Use natural* or mechanical general ventilation adequate to keep concentration below OEL(TLV). If mechanical, use explosion-proof equipment.

No smoking or open lights.

*Equivalent to outdoors.

PROTECTIVE GLOVES – Chemically resistant gloves if needed to prevent repeated or prolonged skin contact.

EYE PROTECTION – Chemical splash goggles or face shield if needed.

OTHER PROTECTIVE EQUIPMENT – Chemically resistant apron or other clothing if needed to prevent repeated or prolonged skin contact.

SECTION IX – SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING – Keep container closed when not in use. Do not handle or store near open flame, heat, sparks, or strong oxidants. Adequate ventilation required.

OTHER PRECAUTIONS – Product is static accumulator; take appropriate precautions when transferring at temperature at or above flash point. Avoid prolonged or repeated contact with skin. Promptly remove contaminated clothing, including shoes; dry before reuse. Wash skin with soap and water after contact.

DATE OF ISSUE: 15JUL 77

☒ NEW ☐ REVISED: SUPERSEDES

APPROVED BY: Industrial Hygiene Division

M A T E R I A L S A F E T Y D A T A S H E E T PAGE: 1

DOW CHEMICAL U.S.A. MIDLAND MICHIGAN 48640 EMERGENCY PHONE: 517-636-4400

EFFECTIVE DATE: 02 OCT 79 PRODUCT CODE: 90692

PRODUCT NAME: VERSENE (R) 220 CRYSTALS CHELATING AGENT MSD: 0854

INGREDIENTS (TYPICAL VALUES-NOT SPECIFICATIONS)	: % :
TETRASODIUM SALT OF ETHYLENEDIAMINETETRA ACETIC ACID TETRAHYDRATE	: 99% :

SECTION 1 PHYSICAL DATA

BOILING POINT: ---- : SOL. IN WATER: 103G/100G @ 25C
VAP PRESS: ---- : SP. GRAVITY: **** SEE BELOW ****
VAP DENSITY (AIR=1): ---- : % VOLATILE BY VOL: ----
APPEARANCE AND ODOR: WHITE SOLID.
****BULK DENS. 45 LBS/CU FT

SECTION 2 FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: NONE : FLAMMABLE LIMITS (STP IN AIR)
METHOD USED: PENSKY-MARTENS C.C. : LFL: NOT APPLIC. UFL: NOT APPLIC.
EXTINGUISHING MEDIA: WATER FOG, FOAM, ALCOHOL FOAM, CO2, DRY CHEMICAL.
SPECIAL FIRE FIGHTING EQUIPMENT AND HAZARDS: NONE.

SECTION 3 REACTIVITY DATA

STABILITY: ----
INCOMPATIBILITY: AVOID CONTACT WITH ALUMINUM. PRODUCT IS HYGROSCOPIC.
HAZARDOUS DECOMPOSITION PRODUCTS: NONE KNOWN.
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

SECTION 4 SPILL, LEAK, AND DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILLS (USE APPROPRIATE SAFETY EQUIPMENT): SWEEP UP AND WASH REMAINDER DOWN WITH WATER. AVOID PUBLIC WATER SUPPLIES.
DISPOSAL METHOD: BURY IN AN APPROVED LANDFILL, IF POSSIBLE, OR INCINERATE ACCORDING TO LOCAL, STATE, AND FEDERAL LAWS.

SECTION 5 HEALTH HAZARD DATA

INGESTION: MODERATE TO LOW SINGLE DOSE ORAL TOXICITY; LD50 (RATS) IS IN THE RANGE OF 630-1260 MG/KG.
EYE CONTACT: PAIN, UP TO MODERATE IRRITATION AND SLIGHT TRANSIENT CORNEAL

(CONTINUED ON PAGE 2)
(R) INDICATES A REGISTERED OR TRADEMARK NAME OF THE DOW CHEMICAL COMPANY

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M A T E R I A L S A F E T Y D A T A S H E E T PAGE: 2
DOW CHEMICAL U.S.A. MIDLAND MICHIGAN 48640 EMERGENCY PHONE: 517-636-4400

EFFECTIVE DATE: 02 OCT 79 PRODUCT CODE: 90692
PRODUCT (CONT'D): VERSENE (R) 220 CRYSTALS CHELATING AGENT MSD: 0854

SECTION 5 HEALTH HAZARD DATA (CONTINUED)

EYE CONTACT: (CONTINUED)
INJURY.
SKIN CONTACT: ESSENTIALLY NON-IRRITATING; SLIGHT REDNESS POSSIBLE UPON REPEATED CONTACT.
SKIN ABSORPTION: NOT LIKELY TO BE ABSORBED THROUGH THE SKIN IN TOXIC AMOUNTS.
INHALATION: NO GUIDE FOR CONTROL KNOWN. NOT LIKELY A PROBLEM. NUISANCE DUST ONLY.
EFFECTS OF OVEREXPOSURE: NONE KNOWN.

SECTION 6 FIRST AID--NOTE TO PHYSICIAN

FIRST AID PROCEDURES:

EYES: IRRIGATE WITH FLOWING WATER IMMEDIATELY AND CONTINUOUSLY FOR 15 MINUTES. REFER TO MEDICAL PERSONNEL.
SKIN: WASH OFF IN FLOWING WATER.
INHALATION: REMOVE TO FRESH AIR IF EFFECTS OCCUR. CONSULT MEDICAL PERSONNEL.
INGESTION: IF SWALLOWED, INDUCE VOMITING IMMEDIATELY BY GIVING TWO GLASSES OF WATER AND STICKING FINGER DOWN THROAT. CALL A PHYSICIAN.

NOTE TO PHYSICIAN:
EYES: MAY CAUSE CORNEAL INJURY OR BURN (TRANSIENT). STAIN FOR EVIDENCE OF CORNEAL INJURY. IF CORNEA IS BURNED, INSTILL ANTIBIOTIC STEROID PREPARATION FREQUENTLY. CONSULT OPHTHALMOLOGIST.
SKIN: NOT LIKELY TO BE ABSORBED IN ACUTELY TOXIC AMOUNTS. MAY CAUSE MILD IRRITATION. TREAT AS ANY CONTACT DERMATITIS.
RESPIRATORY: NO TOX DATA. NO EFFECT EXPECTED.
ORAL: MODERATELY TOXIC.
SYSTEMIC: HUMAN EFFECTS NOT ESTABLISHED. RAT STUDIES INDICATE LIVER AND KIDNEY ARE TARGET ORGANS WITH OVEREXPOSURE. ANIMAL STUDIES WITH SIMILAR COMPOUND SUGGEST THAT WITH GROSS OVER-EXPOSURE THIS MATERIAL MAY BE TERATOGENIC. NO SPECIFIC ANTI-DOTE. TREATMENT BASED ON THE SOUND JUDGMENT OF THE PHYSICIAN AND THE INDIVIDUAL REACTIONS OF THE PATIENT. CONSULT STANDARD LITERATURE.

SECTION 7 SPECIAL HANDLING INFORMATION

VENTILATION: GOOD ROOM VENTILATION USUALLY ADEQUATE FOR MOST OPERATIONS.
RESPIRATORY PROTECTION: NONE NORMALLY NEEDED. IF REQUIRED, USE AN APPROVED 3919
DUST RESPIRATOR.

(CONTINUED ON PAGE 3)

M A T E R I A L S A F E T Y D A T A S H E E T PAGE: 3
DOW CHEMICAL U.S.A. MIDLAND MICHIGAN 48640 EMERGENCY PHONE: 517-636-4400

EFFECTIVE DATE: 02 OCT 79 PRODUCT CODE: 90692
PRODUCT (CONT'D): VERSENE (R) 220 CRYSTALS CHELATING AGENT MSD: 0854

SECTION 7 SPECIAL HANDLING INFORMATION (CONTINUED)

PROTECTIVE CLOTHING: CLEAN, BODY-COVERING CLOTHING. IN ADDITION, CLEAN CLOTH GAUNTLETS AND GLOVES MAY BE HELPFUL.
EYE PROTECTION: SAFETY GLASSES WITHOUT SIDE SHIELDS. WASHING FACILITIES NEAR WORK AREA.

SECTION 8 SPECIAL PRECAUTIONS AND ADDITIONAL INFORMATION

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: AVOID EYE CONTACT. AVOID BREATHING DUSTS IF GENERATED. KEEP CONTAINERS SEALED PROPERLY TO AVOID MOISTURE PICK UP.

ADDITIONAL INFORMATION: REVISIONS 10/2/79 -- INCOMPATIBILITY, EFFECTS OF OVEREXPOSURE, PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE.

LAST PAGE
(R) INDICATES A REGISTERED OR TRADEMARK NAME OF THE DOW CHEMICAL COMPANY

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH, BUT NO WARRANTY, EXPRESS OR IMPLIED, IS MADE.

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MATERIAL SAFETY DATA SHEET

"ESSENTIALLY SIMILAR" TO OSHA FORM 20

FORM 4040 (Rev. 9-80)

ADDRESS: Pennwalt Corporation
500 N.E. Multnomah St.
Suite 880
Portland, OR 97232

9/

PRODUCT IDENTIFICATION

Pennwalt Product Name: Chlorine

Pennwalt Code No.: PT-0804

Chemical Name and Molecular Formula: Chlorine Cl_2

Synonyms:

Emergency Phone Number(s): Portland, OR: 503/228-7655; Tacoma, WA: 206/627-9101

CAS No.(s): 7782-50-5

Chemical Family: Halogen

HAZARDOUS INGREDIENTS

MATERIALS OR COMPONENTS	% w/w	HAZARD DATA (TLV, LD50, LC50, etc.)
Chlorine	99.5+	See Toxicity Section

SHIPPING INFORMATION

RQ CHLORINE (Reportable Quantity: 10 lbs.)
NONFLAMMABLE GAS; UN 1017
For Rail Cars add: "PLACARDED CHLORINE"
Barge, Tank Car, Multi-Unit Car, Ton Container, 150 lb. and 100 lb. cyls.

PHYSICAL PROPERTIES

Boiling Point/Range One atm.	Melting Point	Freezing Point	Molecular Weight (Calculated)
-34.05 °C -29.29 °F	-101 °C -149.8 °F	°C °F	70.906

Specific Gravity (H_2O=1)	Vapor Pressure (mm Hg) psig	Vapor Density (Air=1)
1.468 @ / 0 °C	82 @ 20°C 68 °F	2.482

Solubility in H_2O	% Volatiles by Volume	Evaporation Rate
Slight	100	☐ Ether = 1 ☐ Water = 1 ☐ Butylacetate = 1

Appearance and Odor: Greenish-yellow gas-sharply penetrating odor similar to laundry bleach but more pungent.

FIRE AND EXPLOSION DATA

Flash Point / Test Method	Flammable Limits	Autoignition Temperature/Fire Point
NA °C °F	NA Lower % Upper %	NA °C °F

EXTINGUISHING MEDIA: See below.
☐ Water-spray ☐ Water-fog ☐ Water stream ☐ CO_2 ☐ Dry chemical ☐ Alcohol foam ☐ Foam ☐ Earth or sand

SPECIAL FIRE FIGHTING PROCEDURES: Keep chlorine away from fires; cool container with water spray, do not put water on a chlorine leak.

UNUSUAL FIRE AND EXPLOSION HAZARDS: ☒ Other Chlorine although not flammable is a strong oxidizer and will ignite steel at 483°F.

REACTIVITY DATA

STABILITY: ☒ Stable ☐ Unstable

CONDITIONS CONTRIBUTING TO INSTABILITY: ☐ Thermal decomposition ☐ Photo degradation ☐ Polymerization ☐ Contamination

INCOMPATIBILITY - Avoid contact with: ☐ Strong acids ☐ Strong alkalis ☐ Strong oxidizers ☒ Other (specify): Avoid all foreign materials. Chlorine can react violently with many inorgani and organic materials.

HAZARDOUS DECOMPOSITION PRODUCTS - THERMAL AND OTHER (list): Reaction with ammonia forms nitrog trichloride (chloramine), which is unstable and explosive. Carbon steel ignites at 483°F in a chlorine atmosphere.

CONDITIONS TO AVOID: ☒ Heat ☐ Open flames ☐ Sparks ☐ Ignition sources ☐ Other (specify):

SPILL OR LEAK

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: ☐ Flush with water ☐ Absorb with sand or inert material ☐ Neutralize ☐ Sweep or scoop up and remove ☐ Keep upwind. Evacuate enclosed spaces. ☐ Prevent spread or spill ☐ Dispose of immediately ☒ Other (specify): Evacuate area. Responsible, trained personnel should put on gas mask and investigate and (continued below)

WASTE DISPOSAL METHOD - *Consult federal, state, or local authorities for proper disposal procedures.*
stop leak. Chlorine Institute Safety Kits are availabl for all chlorine containers. Do not use water on a chlorine leak. Call your supplier.

CONTINUED ON REVERSE SIDE

NA – Not Applicable.

10/

TOXICITY

NA

Dermal (acute)
Corrosive

Eye
Corrosive

Inhalation (acute)
LC_{50}: 293 ppm/one hour (rats)

Chronic, Subchronic, etc.

HEALTH HAZARD INFORMATION

Effects of Exposure

PERMISSIBLE EXPOSURE LIMIT (Specify if TLV/TWA or Ceiling [c])
ACGIH 19 TWA 1.0 ppm STEL 3.0 ppm
OSHA 19 Being reviewed
Other:

IRRITATION — Applies to gas
[X] Skin — Severe [ ] Moderate [ ]
[X] Eye — Severe [ ] Moderate [ ] Mild (transient) [ ]

CORROSIVITY — Applies to Liquid
[X] Skin — [ ] 4 hrs. (DOT) [ ] 24 hrs. (CPSC)
[X] Eye — [X] May cause blindness

SENSITIZATION
[ ] Skin [ ] Respiratory [ ] Allergen

INHALATION EFFECTS
[ ] Narcotic effect [ ] Cyanosis [ ] Asphyxiant

LUNG EFFECTS (Specify): Chlorine gas reacts with moisture to form hydrochloric and hypochlorous acids. Therefore, when a sufficient concentration of chlorine gas is present it will irritate mucous tissue, respiratory system & skin.

OTHER (Specify): Causes coughing, restlessness at low concentrations. At higher exposures, can cause vomiting, and even death.

Emergency First Aid

INGESTION
[ ] Induce vomiting [ ] Do NOT induce vomiting [ ] Give plenty of water [X] Get medical attention [ ] Other (specify):

DERMAL
[X] Flush with soap and water [X] Get medical attention [X] Contaminated clothing - remove & launder [X] Contaminated shoes - destroy [ ] Other (specify):

EYE CONTACT
[X] Flush with plenty of water for at least 15 minutes [X] Get medical attention [ ] Other (specify):

INHALATION
[X] Remove to fresh air [X] If not breathing, give artificial respiration [X] Give oxygen [X] Get medical attention [X] Other (specify): Keep warm

SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS — *Always maintain exposure below permissible exposure limits*
[ ] Consult an industrial hygienist or environmental health specialist [ ] Local exhaust [ ] Use with adequate ventilation [ ] Check for air contaminant and oxygen deficiency
[X] Other (specify): Ventilation is advisable in closed quarters. Vents should be floor level because chlorine is heavier than air.

EYE
[ ] Safety glasses [X] Face shield [X] Goggles

HAND (GLOVE TYPE)
[ ] Polyvinyl chloride [ ] Neoprene [ ] Butyl rubber [ ] Natural rubber [ ] Polyvinyl alcohol [ ] Poly-ethylene [X] Other (specify): Any of these

RESPIRATOR TYPE - *Use only NIOSH / MESA approved equipment*
[X] Self-contained [ ] Supplied air [ ] Can or cartridge gas or vapor [ ] Filter - dust, fume, mist [ ] Other (specify):

OTHER PROTECTIVE EQUIPMENT
[ ] Rubber boots [ ] Apron [X] Other (specify): A person making or breaking a chlorine connect should have on his person a suitable escape type respirator.

SPECIAL PRECAUTIONS

PRECAUTIONARY LABELING
[X] Wash thoroughly after handling [X] Do not get in eyes, on skin or clothing [X] Do not breathe gas [ ] Keep container closed [ ] Keep away from heat, sparks, and open flames [ ] Store in tightly closed containers
[ ] Do not store near combustibles [ ] Keep from contact with clothing and other combustible materials [ ] Empty container may contain hazardous residues [ ] Use explosion proof equipment [X] Other (specify): Do not drop container

Other handling and storage conditions: Store in well vented area and away from sources of extreme heat. Personnel handling chlorine should be fully trained on chlorine properties and hazards.

Prepared by	Date	Address	Phone
Gary F. Trojak	11/11/80	3 Parkway, Phila., PA 19102	215/58( )7

PLEASE NOTE ▶ "The above information is accurate to the best of our knowledge. However, since data, safety standards, and government regulations are subject change and the conditions of handling and use, or misuse are beyond our control, Pennwalt MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THE INFORMATION CONTAINED HEREIN AN DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON. User should satisfy himself that he has all current data relevant to his particular us

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin		APPROVALS – DATE
		MGR., MANUFACTURING
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/34 — SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: 5/2/84
MATERIAL (TRADE NAME)	GRADE	CHIEF CHEMIST: 5/2/84
MATERIAL (CHEMICAL NAME): Spent Sulfite Liquor		PLANT PURCHASING AGENT: SP Whittaker
CHEMICAL FORMULA		GROUP LEADER, R & D: 6/25/84
		OTHER: 10/5/84
SAMPLE FOR ANALYSIS: 4 quarts Sample		MGR. PRODUCT ACCEPTABILITY: 6/25/84
APPROVED SUPPLIERS: Georgia-Pacific		

CHARACTERISTICS	LIMITS	METHOD NO.
Base	Fermented calcium base	A. A.
Soluble Solids	23% ± 1%	SRM-10A
Vanillin Potential	7.3±0.3%	SRM-10B
Insoluble Solids	0.5% (Liquid base) Max.	SRM-10A
Ash Content	11.5-14% (Waste liquor solids)	SRM-10C
Sulfur Dioxide	Free	
Nitrogen Content	Negligible	
pH	5.5 min. at no time the liquor has been alkaline	
Reducing Sugars	9.0% (Soluble Solids) Max.	SRM-10D
Boiling Point	Approx. 218°C	
Specific Gravity	Approx. 1.14	

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin

PLANT: Seattle Plant.

ISSUE NO./DATE: 05/01/84

SUPERSEDES SPEC. NO./DATE: 01/01/77

MATERIAL (TRADE NAME): Peneteck

GRADE:

MATERIAL (CHEMICAL NAME): White Mineral Oil

CHEMICAL FORMULA:

SAMPLE FOR ANALYSIS: 4 oz. Sample

APPROVED SUPPLIERS: Penreco

APPROVALS — DATE

MGR., MANUFACTURING

SUPT. MANUFACTURING: 5/2/84

CHIEF CHEMIST: 5/2/84

PLANT PURCHASING AGENT: 5/2/84

GROUP LEADER, R & D: 6/25/84

OTHER: 10/4/84

MGR. PRODUCT ACCEPTABILITY: 6/25/84

CHARACTERISTICS	LIMITS	METHOD NO.
Viscosity, SSU at 100 F	38-42	SRM-6A
Viscosity, cts. at 100 F	3.6-4.9	SRM-6B
Specific Gravity 60/60 F	0.804-0.816	SRM-6C
CFR 121.1146, 121.246 and 121.2589	Pass	
Color	30+ Saybolt	SRM-6D
Boiling Point °F	Approx. 510	
Vapor Pressure	1 mm Hg @ 70°F	
Solubility	Soluble in hydrocarbons	

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin		APPROVALS DATE — MGR., MANUFACTURING:
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/84 — SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: Bruce K. Galante 5/2/84
MATERIAL (TRADE NAME):	GRADE:	CHIEF CHEMIST: S. C. Fung 5/2/84
MATERIAL (CHEMICAL NAME): Calcium Stearate		PLANT PURCHASING AGENT: SP Whittaker
CHEMICAL FORMULA: $Ca(C_{18}H_{35}O_2)_2$		GROUP LEADER, R & D: 6/25/84
		OTHER: 10/5/84
SAMPLE FOR ANALYSIS: 4 oz. Sample		MGR. PRODUCT ACCEPTABILITY: D M Wente 6/25/84

APPROVED SUPPLIERS: Parsons Chemical; Van Waters & Rogers

CHARACTERISTICS	LIMITS	METHOD NO.
Assay	Equivalent of 9.0-10.5% CaO	SRM-2A
Arsenic	3 ppm Max.	SRM-2B
Free Fatty Acid (Stearic Acid)	3.0% Max.	SRM-2C
Heavy Metals (as Pb)	10 ppm Max.	SRM-2D
Loss on Drying	4.0% Max.	SRM-2E

IN-69 (REV. 8/72)

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin		APPROVALS - DATE MGR., MANUFACTURING
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/84	SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: 5/2/84
MATERIAL (TRADE NAME): Liquid Copper Sulfate	GRADE:		CHIEF CHEMIST: 5-C. Fang. 5/2/84
MATERIAL (CHEMICAL NAME): Copper Sulfate			PLANT PURCHASING AGENT: SP Whitaker
CHEMICAL FORMULA: $CuSO_4.5H_2O$			GROUP LEADER, R & D: 6/25/84
			OTHER: 10/5/84
SAMPLE FOR ANALYSIS: 16 Oz. Sample			MGR. PRODUCT ACCEPTABILITY: 6/25/84

APPROVED SUPPLIERS: Van Waters & Rogers; Great Western Chemical Company

CHARACTERISTICS	LIMITS	METHOD NO.
Assay	27.4% to 27.9% as Copper Sulfate Pentahydrate	SV-44 (A.A.)
Specific Gravity	25.1° Be ± 0.02° Be	
Iron	Less than 0.05%	
Zinc	Less than 0.03%	
Magnesium as MgO	Less than 0.003%	
Lead	Less than 0.01%	
Chromium	Less than 0.0005%	
Nickel	Less than 0.004%	
Aluminum as Al_2O_3	Less than 0.03%	
Arsenic	Less than 0.0005%	
Antimony	Less than 0.003%	
Tin	Less than 0.005%	
Silica	Less than 0.002%	
Water Insoluble Matter	Less than 0.06%	
pH	Greater than 2.0	

NOTE: THIS SPECIFICATION IS THE PROPERTY OF MONSANTO COMPANY AND IS FOR INTERNAL USE ONLY. IT MAY NOT BE RELEASED WITHOUT WRITTEN APPROVAL BY DIVISION PRODUCT ACCEPTABILITY.

IN-60 (REV. 5/74)

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

PLANT: Seattle Plant	FOR USE IN: Vanillin	APPROVALS — DATE
MATERIAL (TRADE NAME): Foamaster 1119A	ISSUE NO./DATE: 05/01/84	MGR., MANUFACTURING
MATERIAL (CHEMICAL NAME): Defoamer	SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: [signature]
CHEMICAL FORMULA	GRADE	CHIEF CHEMIST: [signature] 5/4/84
SAMPLE FOR ANALYSIS: 4 oz. Sample		PLANT PURCHASING AGENT: SP Whittaker
APPROVED SUPPLIERS: Diamond Shamrock Chemical Company		GROUP LEADER, R & D: [signature] 6/25/84
		OTHER: [signature] 10/5/84
		MGR. PRODUCT ACCEPTABILITY: D. M. Clente 6/25/84

CHARACTERISTICS	LIMITS	METHOD NO.
Surface tension	26.7 dynes/cm.	
Color	Straw to off white	
Consistency	Opaque fluid	
lbs/gallon	7.5	
Specity Gravity 25/25 C	0.902	
Pour Point	Less than 0 F	
Flash Point (C.O.C.)	340 F	

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin		APPROVALS - DATE
		MGR., MANUFACTURING
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/84	SUPERSEDES SPEC. NO./DATE: 01/01/77
		SUPT., MANUFACTURING: 5/2/84
MATERIAL (TRADE NAME)	GRADE	CHIEF CHEMIST: 5/4/84
MATERIAL (CHEMICAL NAME): Toluene		PLANT PURCHASING AGENT: 5/25/84
CHEMICAL FORMULA: $C_6H_5CH_3$		GROUP LEADER, R & D: 5/25/84
		OTHER: 10/5/84
SAMPLE FOR ANALYSIS: 16 oz. Sample		MGR. PRODUCT ACCEPTABILITY: 6/25/84
APPROVED SUPPLIERS: Van Waters & Rogers		

CHARACTERISTICS	LIMITS	METHOD NO.
Purity, %W., Min.	99.9	SRM-12A
Distillation		SRM-12B
5%	110.1 C	
10%	110.3 C	
90%	110.4 C	
95%	110.6 C	
Dry	110.7 C	
Range	0.6 C	
Color, Saybolt	+30	SRM-12C
Refractive Index @20°C	1.4962	
Viscosity cps @25°C	0.52	
Specific Gravity 60/60°F	0.871	SRM-12E
Sulfur, ppm (wt.)	Less than 1	
Copper Corrosion, 3 hrs @212°F	Pass	SRM-12G

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin

PLANT: Seattle Plant

ISSUE NO./DATE: 05/01/84

SUPERSEDES SPEC. NO./DATE: 01/01/77

MATERIAL (TRADE NAME)

GRADE

MATERIAL (CHEMICAL NAME): Isopropyl Alcohol

CHEMICAL FORMULA: CH_3CHCH_3 (OH)

SAMPLE FOR ANALYSIS: 16 oz. Sample

APPROVED SUPPLIERS: Van Waters & Rogers; Great Western Chemical Company

APPROVALS DATE

MGR., MANUFACTURING

SUPT., MANUFACTURING 5/2/84

CHIEF CHEMIST 5/1/84

PLANT PURCHASING AGENT S P Whittaker

GROUP LEADER, R & D 4/25/84

OTHER: 10/5/84

MGR. PRODUCT ACCEPTABILITY 6/25/84

CHARACTERISTICS	LIMITS	METHOD NO.
Purity, %V., Min.	91.0	
%W., Min.	87.5	SRM-1A
Specific Gravity 20/20 C	0.817-0.819	SRM-1B
Color, Pt-Co, Max.	10	SRM-1C
Acidity as Acetic Acid %W., Max.	0.002	SRM-1D
Non-Volatile Matter, g./100cc Max.	0.002	SRM-1E
Water Solubility	Complete	SRM-1F
Distillation Range:		SRM-1G
IBP, C., Min.	79.7	
DP, C., Max.	80.7	
Range, C	0.8	

RAW MATERIAL SPECIFICATION

PLANT: Seattle Plant	FOR USE IN: Vanillin	APPROVALS - DATE
	ISSUE NO./DATE: 05/01/84	SUPERSEDES SPEC. NO./DATE: 01/01/77
MATERIAL (TRADE NAME)	GRADE	
MATERIAL (CHEMICAL NAME): Sodium Hydroxide		
CHEMICAL FORMULA: NaOH		
SAMPLE FOR ANALYSIS: 16 oz. Sample		

APPROVALS - DATE

MGR., MANUFACTURING

SUPT., MANUFACTURING 5/2/84

CHIEF CHEMIST

PLANT PURCHASING AGENT

GROUP LEADER, R & D 6/22/84

OTHER: 10/5/84

MGR. PRODUCT ACCEPTABILITY 6/25/84

APPROVED SUPPLIERS: Georgia-Pacific; Pennwalt Corporation; Hooker; PPG; Dow Chemica

CHARACTERISTICS	LIMITS	METHOD NO.
Sodium Hydroxide	48.0-50.0% by weight	SRM-3A
Sodium Oxide	37.2-38.7%	SRM-3A
Sodium Chloride	1.100% Max.	SRM-3B
Specific Gravity 60/60°F	1.511 - 1.530	SRM-3C
Boiling Point	293°F	

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin		MGR., MANUFACTURING
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/84 / SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: [signature] 5/2/84
MATERIAL (TRADE NAME) / GRADE		CHIEF CHEMIST: [signature] 5/2/84
MATERIAL (CHEMICAL NAME): Sulfuric Acid		PLANT PURCHASING AGENT: [signature]
CHEMICAL FORMULA: H_2SO_4		GROUP LEADER, R & D: [signature] 6/25/84
		OTHER: [signature] 10/5/84
SAMPLE FOR ANALYSIS: 4 oz. Sample		MGR. PRODUCT ACCEPTABILITY: [signature] 6/25/84
APPROVED SUPPLIERS: Georgia-Pacific; Great Western Chemical; Allied Chemical		

CHARACTERISTICS	LIMITS	METHOD NO.
H_2SO_4	93.2% by weight	SV-79
Specific Gravity 60/60 F	1.835 approx.	SRM-11B
Free Sulfur Dioxide	0.01% Max.	
Fixed Residue	0.028% Max.	
Iron (as Fe)	0.005% Max.	A. A.
Arsenic	0.00005% Max.	SRM-11C
Antimony	0.001% Max.	
Lead	0.005% Max.	SRM-11D

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

	FOR USE IN: Vanillin	APPROVALS - DATE MGR., MANUFACTURING
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/84 | SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: 5/2/84
MATERIAL (TRADE NAME): Liquid Sodium Bisulfite	GRADE	CHIEF CHEMIST: 5/4/84
MATERIAL (CHEMICAL NAME): Sodium Bisulfite		PLANT PURCHASING AGENT:
CHEMICAL FORMULA: $NaHSO_3$		GROUP LEADER, R & D: 6/25/84
		OTHER: 10/5/84
SAMPLE FOR ANALYSIS: 16 oz. Sample		MGR. PRODUCT ACCEPTABILITY: 6/25/84
APPROVED SUPPLIERS: Olympic Chemical Company		

CHARACTERISTICS	LIMITS	METHOD NO.
Assay	38% min.	SV-74
Iron	3 ppm max.	
Heavy Metal as Pb	20 ppm max.	
Water Insoluble	10 ppm max.	
Solution	Clear, light amber	
Sodium Chloride	0.6% max.	
Sodium Sulfite	0.5% max.	
Arsenic	5 ppm max.	
Selenium	10 ppm max.	
Specific Gravity	1.37	
pH (1% solution)	4.1	

MSDS REVISED

RAW MATERIAL SPECIFICATION

FOR USE IN: Vanillin		APPROVALS - DATE MGR., MANUFACTURING
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/84 / SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: 5/2/84
MATERIAL (TRADE NAME)	GRADE	CHIEF CHEMIST: 5/2/84
MATERIAL (CHEMICAL NAME): Sodium Hydrosulfide		PLANT PURCHASING AGENT
CHEMICAL FORMULA: NaHS		GROUP LEADER, R & D: 6/25/84
		OTHER: 10/5/84
SAMPLE FOR ANALYSIS: 16 oz. Sample		MGR. PRODUCT ACCEPTABILITY: 6/25/84
APPROVED SUPPLIERS: Mobil ; Chevron-Canada; Van Waters & Rogers		

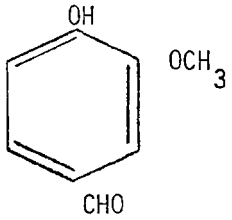
CHARACTERISTICS	LIMITS	METHOD NO.
Total Equivalent NaHS	10.0% Min.	SRM-7A
For 45% solution of NaHS		
Freezing Point	63°F	
pH	9 - 12	
Specific Gravity	1.314 at 60°F	
Odor	Characteristic of rotten egg	
Boiling Point (Initial)	250°F	

RAW MATERIAL SPECIFICATION	FOR USE IN: Vanillin	APPROVALS _ DATE: MGR., MANUFACTURING
PLANT: Seattle Plant	ISSUE NO./DATE: 05/01/84 / SUPERSEDES SPEC. NO./DATE: 01/01/77	SUPT., MANUFACTURING: 5/2/84
MATERIAL (TRADE NAME)	GRADE: -	CHIEF CHEMIST: 5/1/84
MATERIAL (CHEMICAL NAME): Sodium Sulfite		PLANT PURCHASING AGENT:
CHEMICAL FORMULA: Na_2SO_3		GROUP LEADER, R & D: 6/27/84
		OTHER: 10/5/84
SAMPLE FOR ANALYSIS: 4 oz. Sample		MGR. PRODUCT ACCEPTABILITY: 6/25/84
APPROVED SUPPLIERS: Van Waters & Rogers ; Stauffer Chemical Company		

CHARACTERISTICS	LIMITS	METHOD NO.
Assay	95.0% min.	FCC Method
Arsenic	3 ppm max.	
Heavy Metals as Pb	10 ppm max.	
Selenium	30 ppm max.	
Bulk Density	Approx. 74 lbs/ft^3	
Melting Point	Decomposes at 150°C	
Solubility	27g/100g H_2O at 20°C	
pH	9.6 to 9.8 (1% aqueous solution)	

VANILLIN - HISTORY AND USES

Vanillin is the common name for 3-methoxy 4-hydroxybenzaldehyde.



Vanillin occurs in nature in the form of its glucoside which decomposes to Vanillin and sugar on hydrolysis. Its presence has been reported in many oils, balsams, resins, and woods. The best known natural source of Vanillin is the Vanillin plant (Vanilla plansfolia) which belongs to the orchid family. The vanilla bean was used by the Mexican Indians at the time of the Spanish conquests and was brought to Spain and Europe at the beginning of the Sixteenth Century. From that time until today, it has been a favorite food flavor. Vanilla beans are now grown in Mexico, Madagascar, Indonesia (Java), Reunion, and Tahiti.

Vanillin is produced synthetically, but derived principally from lignin, the major component in the spent sulfite liquors from sulfite pulp mills. Until recent years most of the Vanillin production was used as a flavoring agent in ice cream, candies, cookies, puddings, cake mixes, gelatin desserts, soft drinks, etc. The balance was used in deodorants, perfumes, and odor fixatives, and as a masking agent in pharmaceutical and vitamin preparations.

Recently, the greatest use for technical Vanillin has been a chemical intermediate in the production of pharmaceutical products. 40% of the Vanillin is consumed in manufacturing drugs such as Aldomet, Levodopa, and Trimetharpim. Vanillin has also been used in the synthesis of papaverine, L-dihydroxyphenylalanine and other potentially useful derivatives.